



image may be made more or less persistent. It has to be suited to the particular needs, and this can be done.

### Discussion

DR. A. HYMAN: The apparatus shown by Dr. Hirsch opens up great possibilities connected with the fluoroscopy of calculi on the table. There is no question about the advisability of employing roentgen-ray plates or fluoroscopy for cases of multiple calculi on the operating table. At Mount Sinai Hospital we are doing it now as a routine procedure. At first we tried fluoroscopy, but found many disadvantages in that method. It is often impossible to bring the kidney out on the abdominal wall so that we finally discarded that method and have been using the plate method, developing the plates immediately in a special dark room on the operating floor. The disadvantage is the time lost in waiting for the development of the plate, this is usually 7 to 10 minutes.

As to the advisability of making such examinations, I have in mind three cases in which the operator was firmly convinced that all of the stones had been removed; in all of them the roentgen-ray plates taken on the table showed fragments that had been overlooked and later might have been considered recurrences.

The method which Dr. Hirsch has shown is, of course, a great improvement on the ordinary fluoroscopic screen; if it works out as well with stones as with the keys and other bodies shown heretofore, it will be of great assistance. Of course, we shall have to experiment with the different types of stones: uric acid, phosphatic, etc., in order to differentiate the intensity of the shadow; but judging from the demonstration it seems to be a very valuable procedure.

DR. L. T. LEWALD: There are two reasons for using a film, which I would like to mention. One is that the film is much more delicate in recording shadows than the fluoroscopic screen, and I prefer it, especially in cases of very small calculi, rather than the screen images. I have just read a book by Sir John Collie,<sup>1</sup> the English medical jurisprudence authority, who calls attention to the fact that, for example, fractures of the bones have at times been missed in attempts to diagnose them by fluoroscopic methods, and that later on these fractures were shown on the roentgenographic film. The same

<sup>1</sup>Collie, Sir J. *Malingering and Feigned Sickness*. London, 1917, p. 471.

thing applies here. The most minute fragment is the one we want to be sure is not left behind, if it is possible to remove it. The second reason is that in the film we actually have a record which may be used to prove that everything possible was done to show that no fragment was left in the kidney. That record can be filed and used later on if necessary. The fluoroscopic record would be a matter of personal opinion, and we would have nothing to show for it.

DR. E. L. KEYES: Dr. LeWald's remarks remind me of a case I saw operated upon with the aid of films at a very scientific clinic. Stones were removed from the kidney, a pyelogram was made, developed, reported back as showing more stone, the operator fished more stone out, took another film, sewed up the wound while waiting to hear the report and that report was still "more stones."

The element of time, therefore, is of great importance and I look forward to receiving much assistance from Dr. Hirsch's films.

DR. F. T. LAU: It would seem that Dr. Hirsch has given us something very practical, and if we can with it realize the difference in shadows of stones of different compositions we will have a very valuable addition to our armamentarium for eliminating kidney stones.

DR. I. SETH HIRSCH: Dr. Keyes has answered Dr. LeWald's argument. When it becomes necessary to repeat the examination several times, this screen examination is certainly superior to the film examination, for it takes 10 minutes to get a film exposed and developed.

To make sure that small shadows are not overlooked a magnifying glass may be incorporated into the hood.

I know that a film shows more detail than does the fluoroscopic screen image, but Dr. LeWald ought to know this is not because the screen is less sensitive to roentgen ray. On the contrary, any fluoroscopic screen is far more sensitive than any photographic emulsion. But ten times as many roentgen rays are used in making the film as in fluoroscopy. If the same amount of energy is used in fluoroscopy as in making the roentgenogram the most exquisite detail of deep and superficial parts may be seen in the screen.

I do not present this as a perfected instrument. Only by trial can it be made so, but it has possibilities of being of great use to the genitourinary surgeon.

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the left hand. Could use the right shoulder but could not flex the fingers well.

*Comment.* Although there was evidently complete paralysis of the extremities and the roentgenogram showed the fracture, the cord was not entirely destroyed. By traction the cord was released from pressure. Gradually there was complete union of the fragments.

CASE III. A. C., aged nine, was admitted September 21, 1918. He had fallen from a tree and was brought to the hospital with complete paralysis of both lower extremities. Roentgenogram showed a fracture of left transverse processes of D10, D11 and D12, fracture of the body of L1, and marked rotation of the vertebrae.

The child was put on a Bradford frame. The neurological surgeon was inclined toward a laminectomy but the neurologist objected. The child was therefore treated conservatively. After two weeks a plaster jacket was applied and later on, a brace. He was discharged on December 13, 1918 being able to walk. He came to the out-patient department for one and one-half years, when the brace was discarded. The last examination showed him walking without a limp. There was kyphosis at D8 and D12, also at L1 and L2. He could bend forward and laterally, though there was no motion in the involved area.

*Comment.* Although there was a distinct fracture and rotation of the lumbar spine, still the cord was not sufficiently damaged to cause permanent injury. At the early examination it was thought that the pressure on the cord had to be relieved immediately, but it disappeared during conservative treatments.

CASE IV. J. C., aged, thirty-eight, laborer, was admitted September 21, 1922, after falling from the first floor and striking the back and head. He was brought to the hospital with paralysis of both lower extremities but control of the sphincters. There was no deformity of the spine but marked tenderness in the region of D9 and D10. Roentgenogram showed crush fracture of L1.

He was put on a Bradford frame for three weeks, then in a plaster jacket. He continued to improve. Plaster casts were then applied to

the feet and he began to walk. On March 17, 1923 he was taken out of the hospital by the compensation insurance company. Our opinion was that there was permanent damage to the cauda equina.

The patient was seen again July 10, 1926. He was then walking with a steppage gait, and had no power in the dorsal flexors of his feet. The spine was free. Orthopedic operations for the feet were advised but the company refused.

*Comment.* While the injury is permanent the improvement is sufficient to enable the man to walk. We feel that had not the company interfered the improvement would have been greater. Orthopedic operations would have helped the feet and the patient could then have returned to work instead of becoming a permanent cripple.

CASE V. S. F., Male, aged twelve, sustained an injury to his spine in May, 1921 and was brought by ambulance to Fordham Hospital where he was kept for three days. He showed no symptoms whatever; the roentgenogram was negative, and he was therefore discharged. (He was not seen by me during his stay in the hospital).

He came to my out-patient clinic in July, 1921. He then had marked spasm in the cervical spine. His head was held to the right and flexed forward while the chin turned to the left. Any attempt at motion produced pain. There was tenderness over the spinous process of C5. The pain was relieved by traction on the head. The right hand showed weakness in motor power but no definite signs of paralysis. Marked numbness and cyanosis were present. Roentgenogram taken immediately showed a fracture of the body of C5 and bending backward of the spinous processes. The boy was readmitted to the hospital. A Calot jacket was applied and later changed for a collar. He made a perfect recovery in about ten months.

*Comment.* The above case demonstrates clearly that the symptoms of a fracture are often deceiving. Not even the roentgenogram showed the line of fracture. It takes a few days to bring out the symptoms and if the case is lost sight of grave consequences may result. It may be worth while to emphasize the necessity of watch-



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# ORTHOPEDIC METHODS CHARACTERISTIC OF SWEDEN\*

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IN many ways the methods of treating crippled children in Sweden are not unlike those adopted the world over. Some of the distinctive methods have been mentioned in discussing the Stockholm unit for the care of crippled children. There are, further, several groups of orthopedic conditions in the treatment of which the Swedish methods are characteristic.

## ANTERIOR POLIOMYELITIS

In the description of the day's work at the Stockholm Clinic for the care of crippled children anterior poliomyelitis in various stages was seen to be relatively common. Ever since the great epidemic in 1911 and 1913, this dreaded disease has been reaping a terrible toll in paralysis in Sweden, until the relative percentage of cripples seems to be greater than in any other country. It is said that about 60,000 of the 6,500,000 people in Sweden are suffering from the effects of this scourge. Haglund, through fifteen years of active participation and direction in the care of thousands of cases, has acquired experience that lends authority to his views on the subject. Under the Swedish system, patients can be traced throughout the entire course of their lives. In this way, the therapeutic measures have been improved, and those which stood the test of time have been retained. Experience is important in the outcome and has shown, among other things, that the period of recovery is far longer in a case of generalized paralysis than in one of involvement of a single limb. General principles of

treatment are followed and a plaster bed or an ordinary bed and splints insure the necessary rest in the first stage. Individually formed, light, durable splints of celluloid prevent contractures and over-stretching of muscles, and the physiotherapist starts muscle-training exercises and massage in the second stage. Temporary overexertion of muscles is not particularly feared. The early application of plaster casts and of braces is a distinct feature in the treatment of poliomyelitis carried out here.<sup>6</sup> The object is to get the patient up and about as quickly as possible. The idea is based on the principle that the best exercise obviously is not the introduction of freak movement but the training and development of the muscles to perform those duties which they will be called on to execute in daily life. The truth of this idea was in a great measure responsible for the phenomenal success of the renowned instrument maker, Hessing. The perfection of the Hessing types of support (Figs. 1 and 2), which have been adopted with some modifications, makes the execution of this idea feasible. It is to be borne in mind, however, that a brace is not applied until the deformity has been corrected and the extremity has been put into the position intended. The braces almost uniformly meet with the approval of the patients who are concerned primarily with functional improvements and they soon learn to appreciate and demand durable supports. With the development in perfection of external supports, the indications for arthrodesis

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of the upper border of the auricle and above, in the direction of a line passing through the middle of the nasolabial fold, will indicate the portion  $ab'c$  of the cutaneous flap which must be excised. Following the wavy line  $bdc$  (Fig. 2'), make an incision that grazes the superior incision of the pinna, follows the crest of the tragus, and grazes the anterior insertion of the lobe of the ear.

Denude all the pretragal region bounded by the incision  $bc$  and by the incision  $bdc$  (Fig. 2').

Figure 3. Tailor out of the vertical portion of the flap  $abc$ , a profile  $bc$  to be coapted with the exposed portion of the tragus  $bdc$  (Fig. 3''), this segment to be sutured flush with the antero-superior insertion of the pinna, on the crest of the tragus and flush with the insertion of the lobe of the ear.

First suture the horizontal incision  $ab$  with medium horsehair, then suture the vertical incision  $bc$  with fine horsehair.

The result of the operation is shown in the insert (Fig. 3').

#### TECHNIQUE FOR WRINKLES OF THE LOWER PORTION OF THE FACE

The facial defects corrected by this procedure are: the nasolabial fold, wrinkles or folds that disfigure the mouth, ptosis of the cheeks, flaccidity of the region of the chin, and double chin.

Figure 4. Linear anesthesia follows the line  $abc$ . Infiltrate all the shaded region  $z$ , that is to say, the posterior parotid region, the lateral cervical region beneath the lobe of the ear and the middle portion and tip of the mastoid region.

The lines of incision are one curved portion  $ab$ , and a straight portion  $bc$ , making a right angle with the upper end of the curved incision, on the middle portion of the mastoid region.

The only resisting and solid point for attachment in this region is the periosteum of the mastoid process. If, as in the previously described procedure, we make only a semilunar cutaneous dissection, below the lobe, the scar spreads, the lobe elongates,

the ear enlarges and becomes deformed. In this dissection all the resistance and traction are in the line  $bc$ .

Detach all the shaded area as broadly as possible, forward and downward.

Figure 5. A pull on the cutaneous flap  $abc$  will show how much must be cut away. This resection is made with scissors, a slice at a time. The same procedure is followed along the straight incision  $bc$  as along the curved incision  $ab$ . The resected portion should be broad along the horizontal part as indicated by the dotted line  $dc$ , but less is cut off along the curved line  $ab$ .

Figure 6. After the triangular resection,  $bdc$  of the cutaneous flap is finished, suture the lips  $bc$  and  $dc$  with medium horsehair beginning at the point  $c$ . When this suturing is finished, resect all that is necessary along the curved edge  $ad$  of the cutaneous flap to make the coaptation perfect. Suture the lips  $ad$  and  $ab$  with fine horsehair along the groove behind the ear.

The line of suture on completion of the operation is shown in the insert (Fig. 6').

#### TECHNIQUE FOR DEFECTS OF THE CERVICAL REGION

This procedure corrects the same defects as the previous technique but it also removes all the cutaneous furrows of the neck and does away with the folds, wrinkles, puckers and tendinous ridges of this region.

Figure 7. Linear anesthesia follows the line  $abcd$ , along the groove behind the ear, over the middle mastoid region and the lateral region of the back of the neck. All the lateral region of the back of the neck should have been extensively shaved, to have the scar covered by the hair.

Employ diffuse infiltrative anesthesia of all the shaded region  $z$ , the posterior parotid region, the middle and tip of the mastoid region and the upper part of the side of the neck.

The line of incision is along  $abcd$  in the posterior fold of the auricle, over the middle of the mastoid and along the lateral region of the back of the neck and as far down as the insertion of the hair will allow.

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procedure), and that but few were using chemicals to aid in this sterilization.

It was also found that the same gloves are being used for clean and dirty cases, with incomplete sterilization, and that but few hospitals have a periodical laboratory check on the operating department and personnel.

Until gloves are so made as to permit repeated steam sterilization under pressure, the glove problem will continue to be a grave one. However, it can be aided by gluing a red patch on each glove used in a dirty case, to prevent its use afterward in a clean one, and by soaking the gloved hands in 1 to 250 bichloride of mercury solution.

Hospitals are also, many of them, careless in avoiding leaky gloves, and looking after hands of surgeons and nurses that are chapped or irritated. This latter can be cared for by the use of two pairs of gloves, one over the other.

In the operating room, hand solutions should be of bichloride of mercury and not of sterile water. Even theoretically, as far as bad effect upon the tissues is concerned, there is but little difference between the two, and bichloride of mercury certainly safeguards sterility more perfectly.

The use of antiseptics in wound dressings should be commended. In clean cases bichloride of mercury does less harm than the inevitable infection in an open, clean wound from skin and air. In septic cases it undoubtedly, to some extent at least, lessens infection.

Other antiseptics are also helpful in their places, including wet dressings of weak carbolic acid solution when indicated. The chlorine antiseptics, properly employed, have revolutionized the treatment of septic wounds, dichloramine-T for superficial, and Dakin's solution for deep, wounds. Discharging wounds should be kept securely padded with absorbent materials to prevent leakage, and dressing of all wounds should be done instrumentally, septic discharges and soiled dressings being promptly immersed in antiseptic solutions.

Finally, when the surgeon is in doubt as to strict cleanliness being properly observed, let him here, at least, return in part to old-time methods and safeguards, by free bathing or irrigating with bichloride of mercury solution. The same thought was in the mind of the English surgeon, Godlee, when, in the second year of the Great War, seeing how utterly helpless his colleagues appeared to be in the management of the horribly infected shell wounds, and the frightful mortality, he wrote his splendid article, entitled, "Back to Listerism." In this he urged the profession to return to the freer use of chemical antiseptics.

There are other important points to be strictly looked after in the operating room. The least slip on the part of the surgeons, assistants, or nurses may greatly mar the success of the operation and endanger the life of the patient.

In nearly all hospitals these vital matters are left entirely to the operating-room nurses. While many nurses are safe and do splendid work, yet many of them do not realize as fully as the surgeon the extreme importance of attention to every detail of surgical cleanliness in the operating room. Then too, they are frequently influenced by careless operators to relax in their precautions, and especially if the same operators get fair results. They come to feel that the very strict operators are overparticular and unreasonable. In short, the careful operator is, under the present system, directly at the mercy of the nurse in charge of the operating room.

In a general hospital, where a number of surgeons operate, it is probably unwise to operate on clean and dirty cases in the same room. It is exceedingly difficult under such circumstances to keep the room free from infection. The only way to do this and be safe is to catch and destroy every particle of infectious discharge, and promptly soak every spot on floor or table with a strong antiseptic.

In the early days of antiseptics in this country there existed strict operating

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Operation, January 6, 1926: Bone graft from tibia to third, fourth and fifth lumbar spine and into sacrum (Albee technique). Patient kept flat in bed for eight weeks; then got about gradually using crutches for three months. Fitted with a long heavy-boned corset. Rest and quiet for six months.

Returned to work November, 1926. Now can walk twenty blocks without pain and is doing her previous work.

(No discussion)

### OSTEOSARCOMA OF THE FEMUR FOLLOWING FRACTURE

#### LANTERN SLIDE DEMONSTRATION

HENRY KELLER, M.D.

(By invitation)

A man, aged forty-eight years, single, came to the Cancer Hospital, September, 1926.

Eighteen months previously he had jumped on the tail-board of a truck and struck his right leg, but he paid no attention to this injury and continued to work. A few days later he began to feel slight pains in his right knee,

to Bellevue Hospital, on account of his leg condition, where he was given baking and



FIG. 2.

massage for awhile, without relief. Two Wassermann tests were negative.



FIG. 1.



FIG. 3.

he noticed a small lump there and began to walk lamely. The condition remained the same for six months. About that time the patient left his job as moving van helper for lighter work in the kitchen. In January, 1926, he went

In August, 1926, while intoxicated the man fell down on the street, injuring the same limb. He was taken by ambulance to Bellevue Hospital, and a few days later it was noticed that there was fracture of the right femur. A



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## CONGENITAL CYSTS OF THE NECK IN CHILDREN\*

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THE fascinating side of neck cysts in children is their embryological origin; and one cannot grasp the significance of these lesions unless a study is made of the fetal anatomy. These cysts are always surgical conditions and their cure is entirely dependent on a complete knowledge of the embryonal structures from which they are derived. There are six distinct types of neck cysts, but the parasitic, the inclusion dermoid and thyroid cysts are so rare in children that it does not seem practical at this time to consider in detail any except the hygroma, the thyroglossal and the branchial type.

### HYGROMA

This type is often spoken of as a lymphocele and is always of lymphatic origin arising from the jugular sinus, a fetal bud developing about the third month of embryonal life. Lymphatic development begins at about the sixth week and the jugular and subclavian lymph sacs are well developed in a 30 mm. embryo. They are found lying between the primitive jugular and subclavian veins and connect directly with these structures. In the ordinary course of events these embryonal structures become obliterated by the growth of reticulated connective tissue

and the formation of lymph follicles and gland nodes, both taking their origin from the endothelium lining the primary sacs. Sometimes structural faults occur in the developing embryo which result in a failure to obliterate all or a part of the jugular and subclavian lymph sacs and these remain to develop after birth into cystic tumors of the neck.

The jugular sinus extends from the base of the skull at the jugular foramen downward to the subclavian vicinity under the clavicle. Thus is explained the location of this tumor at any point from near the styloid process to the axillary space. Usually it is found in the lowest part of the posterior triangle and, strangely, is more common on the right side of the neck. I have seen but one on the left side and find one other reported by Lyle.

In children these cystic growths show as a soft, spongy tumor. They begin as a small mass remaining quiescent for months or years and then suddenly take on a rapid growth. A common history is that of trauma followed by an immediate and rapid enlargement of the mass, while infection and toxic absorption incident to the acute diseases of childhood is very commonly a factor exciting to sudden and increased growth. Thompson thinks this is due to an increased secretion of lymph

\* Read by invitation before the Medical Society of the State of North Carolina, April 19, 1927.



such is not the case and there then persists a tube extending part or all the way from the foramen cecum at the base of the



FIG. 3. Photograph of Winslow's case showing hygroma extending from the clavicle downward into the axilla and onto the arm. (By permission.)

tongue to the thyroid isthmus. This later develops into a cyst and its complete surgical removal depends on the amount of

cure. Too often, however, the cyst is not all of the vestigial remains and a small tube, lined with a single layer of epithelium, runs back to the hyoid and often beyond the hyoid through the tongue to the foramen cecum. Operative failures are of course due to incomplete removal but the great problem for the surgeon is how to know when complete eradication has been accomplished.

The persistent duct is usually too small for macroscopic demonstration and it is only by second and third operative attempts to cure that the surgeon realizes he must dissect the complete course of the embryological vestige. Injection of the cyst with an aniline dye has found favor with some surgeons but this measure has too often failed. The surgical cure of these cysts can therefore be divided into two varieties of operations: first, the conservative which attempts to remove only what is visible, and second, the radical which begins the dissection at the thyroid isthmus



FIG. 4.



FIG. 5.



FIG. 6.

FIG. 4. Sketch of author's case showing hygroma situated at the usual location between the clavicle and submaxillary region.

FIG. 5. Sketch of author's case showing the unusual location of a hygroma on the left side of the neck extending from the submaxillary region downward below the clavicle over the pectoral muscle.

FIG. 6. Drawing representing author's case of cervical sinus as cited in manuscript with location at about the midpoint of the left sternomastoid muscle along the internal border.

the original tube that remains patulous; occasionally the demonstrable cyst is all of the persistent embryological structure and surgical removal of this cyst will suffice to

and passing up includes a small central piece of the hyoid bone and all of the vestigial tract up to the foramen cecum, thus extending through the floor of the mouth

and the entire thickness of the tongue at its base. This dissection calls for the removal

eight cases of this type all of which have been cured by complete surgical removal.

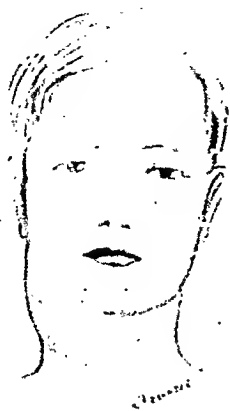


FIG. 7.

FIG. 7. Sketch of drawing from a boy eleven years old showing a typical cervical cyst arising from the cervical sinus and situated high in the neck between the parotid gland and the thyroid cartilage.



FIG. 8.

FIG. 8. Drawing of a typical case of thyroglossal cyst with discharging fistula in the midline of the neck.

of the persisting central tubal bud or tract, the center of the hyoid bone, the fibrous raphé of the mylohyoid, geniohyoid and geniohyoglossus muscles together with the adjacent tissues of tongue around and including the foramen cecum.

The recognition of this type of congenital cyst should be easy for it always occurs in the midline between the symphysis mentis and the thyroid cartilage. It should, however, be differentiated from ectopic thyroid tissue, enlarged submental gland, inclusion dermoids which are always found in the median line, lingual dermoids, submental cysts which develop from the cervical sinus and often called ranula, and lastly from the true cervical fistula which is of branchiogenic origin and always situated lateral to the midline along the anterior border of the sternomastoid muscle.

Then too, the thyroglossal cyst always contains as sticky mucus in contradistinction to the pale, coagulating type of lymph found in the hygroma; and if this sticky mucus is carefully examined with the microscope there will often be found epithelial cells. No cells are found in fluid aspirated from an hygroma. We have had

### BRANCHIOGENETIC CYSTS

This form covers the commonly seen cysts in the neck grouped under the head-

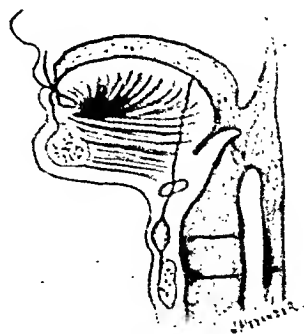


FIG. 9. Schematic drawing showing grossly the anatomical course of a thyroglossal cyst and tract. Note the fibrous connection with the thyroid cartilage and the extension of the tract upward through the middle of the hyoid bone and muscles of the tongue to the foramen cecum.

ing of ranula, submaxillary cyst and cervical cyst. That these cysts are embryo-

logical in origin has long been believed but no definite structural origin was worthy of acceptance until James E. Thompson advanced his theory that these types of cyst are all derived from embryological remains of the cervical sinus. Time will not permit the writer to give you any description of minute embryology relative to this structure, but quoting rather liberally from Thompson we may relate as follows:

At the fourth week of the embryo, the second arch grows downward and covers the third and fourth arches and touches the body wall behind the fifth arch. This growth is analogous to that forming the gill cover in fishes, thereby the mouths of the second, third and fourth cleft depressions are covered up and a space is shut off into which they open. This space is called the cervical sinus and extends from the tonsils or second cleft to almost any point on the front of the neck. This sinus is usually obliterated but when this does not occur a cyst or sinus may result. For a surgeon to know that a ranula may connect, through a persistent sinus, with the tonsils is highly important and that one of these cysts of branchiogenetic origin may be subject to fragmentation or isolation by muscular action, thus producing one or more cysts all arising from a mother cyst is really the crux of the problem relative to surgical cure. No satisfactory evidence has ever been advanced to prove that ranulas come from mucous glands in the floor of the mouth or from salivary glands; and agreeing with Thompson, the whole subject is tremendously clarified if we accept the following:

From the vestigial remains of the branchial clefts are derived the ranula, the submaxillary and deep cervical cysts; the primary cyst results from the persistence of the cervical sinus and this is often carried from the original position by the shifting of the muscles during the formation of the neck. By the same muscles, isolation or fragmentation occurs and parts of the mother cyst are carried backward

by the palate muscles while part is carried into the submaxillary region and tongue by the migration of the muscles of the hypoglossal group.

It is quite common to see the persistent embryological structure show as a sinus or fistula discharging on the surface of the neck, but the distinctive feature is that the opening is always located along the anterior border of the mastoid muscle. It has been observed that this fistula first began to discharge following one of the acute infections such as measles or scarlet fever and under these conditions it is often confused with the sinus of a suppurating cervical gland. If we have a true branchiogenetic fistula, a fine probe can sometimes be passed quite high in the tract which is at once suggestive, and particularly instructive will be a microscopic study of the discharge which will often show epithelial cells, for all branchial cysts and fistulae are lined with epithelium.

I have seen several branchial cysts but only one cervical fistula, and in this one case cure was brought about by an incomplete operation. The tract was dissected out above the branching of the carotids and there become so small that it was thought best to sever the connection. The neck wound healed tightly and it is assumed that the remaining portion of the tract opened into the pharynx and thus drained to the point of least resistance. Congenital cysts of the neck offer an interesting problem to the pediatrician and while the diagnosis is not always easy I must confess to the feeling that the cure of these cysts presents a delicate and often difficult surgical undertaking.

#### BIBLIOGRAPHY

1. DOWD, C. N. *Ann. Surg.*, 1913, lviii, 112.
2. KAHN, L., and GRAVES, S. *Ann. Surg.*, 1918, lxxvii, 71.
3. KLINGENSTEIN, P., and COLP, R. *Ann. Surg.*, 1925, lxxxii, 854.
4. LIPSHUTZ, B. *Ann. Surg.*, 1924, lxxix, 499.
5. PAYNE, R. L. *South Surg. & Med.*, December, 1921.
6. THOMPSON, J. E. *Proc. South. Surg. Ass.*, 1919.
7. WINSLOW, R. *Surg. Gynec. & Obst.*, 1917, xxv, 429.



# URETERAL STRICTURES

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THE path of the trail-blazer has ever been strewn with difficulties. Columbus and Daniel Boone are conspicuous examples in the physical world, Jefferson and Thomas Paine in the realm of government and statesmanship, of the hardships to be overcome when effort is made to run counter to current trend of thought.

Should the trail of the medical explorer lead into virgin soil, he finds that every point of advance has to be stoutly contended: on the one hand, against the fallacies of inherited tradition and, on the other, against the inherent quizzical bias of the medical mind, which demands absolute physical proof of every statement made or theory advanced.

Scarce two score years ago, Reginald Fitz blazed the trail to the right iliac fossa by his epoch-making observations bearing on the relation of peritonitis and diseased conditions of the appendix. Did these observations and the deductions based thereon, although true and sound and a thousand-fold fortified by subsequent knowledge, pass unchallenged by his contemporaries? Not a few, living and working today have been active participants in many of the skirmishes necessary to establish upon a firm basis some of the mooted questions of the surgery of the appendix. And yet, what commonplace things these are now, which were scarcely known, or believed in, forty years ago!

Through the ages, the ureter, occupying a modest seat behind the peritoneum, unstudied, untouched—save to have removed from its lumen obstructing stone concretions—has played the rôle of absolute passivity; that of connecting one organ with another, in much the same fashion as a cast-iron pipe links the toilet bowl with the sewer main. That the ureter is com-

posed of living cells, clothed in the same raiment of mucosa, muscularis and serosa as other important ducts, and consequently subject to the same vicissitudes of infection and inflammation, seemed to make but feeble appeal to the student of pathology.

Just ten years ago, Hunner, of Baltimore, began his pioneer work in this hitherto untouched field, which in all propriety might be called the ureteral trail. Within this short time, despite the many cynical bolts which have been hurled against his work, by reason of his dogged persistence and incessant preachments, most of the underbrush has now been cleared and this path stands out, for those who will but seek, as clearly as the noon-day sun. For the earnest clinician, as well as for the unbiased urologist or gynecologist, ureteral stricture should be considered as a distinct pathological and clinical entity, always to be seriously reckoned with when seeking a proper solution of any of the vague diagnostic problems within the abdominal cavity.

The intention here is not to offer defense or apology for the workers in this field. None is needed; the proof of this statement is to be had both in the increasing number of urologists from whose eyes the scales are fast falling, and in the number of relieved and satisfied patients, which after all, constitutes the acid test of all clinical therapy.

The reasons for this tardiness in accepting ureteral lesions as frequent symptom-producing factors as well as important elements in the production of kidney affections are not far to seek. The pioneer work in this field has been done largely by men working in the female and with the simple Kelly cystoscope, both of which factors permit of easy and ready approach

\* Read before The Southern Surgical Association, December 14, 1926, at Biloxi, Miss.

to the ureter with bougies and bulbed catheters of large caliber. Just as the smaller sized steel sounds introduced into the male urethra fail to detect narrowing and obstruction here, just so certainly may the No. 5 or No. 6 ureteral catheter fail to reveal appreciable narrowing within the ureteral lumen. Within the past few years, considerable change and modification has been made in the more complicated electrically lighted instruments, designed for use in both sexes, with the result that many workers who formerly were inclined to protest vigorously against the clinical entity of ureteral stricture are now reporting large series of cases in which this lesion is of frequent occurrence.

Rathbun, of Brooklyn, reporting recently a study of 739 cases from a general urologic clinic made a diagnosis of ureteral stricture on radiologic evidence alone, and exclusive of tuberculous kidneys (in which ureteral lesions practically always occur) in 85 cases, 44 of which were in males and 41 in females. The greater incidence of this lesion in the male in this series of cases is both interesting and illuminating. It clearly shows that the male by no means enjoys immunity from ureteral stricture, which will be demonstrated if only proper search is made.

One is almost certain to miss, in many vague abdominal cases, the proper diagnostic trail, unless both the frequency of this lesion, and its protean manifestations are constantly borne in mind. One rarely recognizes a thing about which one does not think or for which one does not seek. Consequently, until urologists learn to look for, and internists, surgeons and general practitioners are taught to think in terms of, ureteral obstructive lesions, this important field is likely to suffer neglect.

There are a few embryologic and anatomical facts that serve to explain some of the confusing symptoms to which lesions within the ureter may give rise.

Embryologically, the kidney has a double origin. The secreting or cortical portion is derived from the mesothelium: from the

Wolffian duct is derived the mechanical or collecting part, consisting of the calyces and straight collecting tubules, the pelvis and ureter, as well as the vesical trigone and urethra. Anatomically, one is not accustomed to think of the ureter as being prolonged above into the kidney and below through the bladder as the trigone, and, to the outside world, as the urethra. Yet, embryologically it is one continuous tube, and it is well for the clinician to bear this fact constantly in mind.

Again, the innervation of the ureter is derived from the sympathetic system and is in intimate association with nerves supplying the kidney, bladder, ovaries, testes and practically all organs within both the abdominal and pelvic cavities. These simple facts serve as a basis of explanation for the frequency with which ureteral lesions may be confused with symptoms which seem to arise from other organs. The pain of ureteral stone reflected to bladder, testicle or penis is the common knowledge of all; by the same token, any ureteral lesion other than stone may be and often is, mirrored in bladder, urethra or one of the pelvic or abdominal organs. Vesical frequency or irritation no more connotes vesical inflammation than does nausea or vomiting indicate gastritis. The trained eye of the cystoscopist, upon viewing a practically normal urethra and bladder, at once turns to the tract above for an explanation of the vesical symptoms.

Recently a patient was seen who, for ten years, both day and night, had had intractable bladder symptoms. An exhaustive study of the entire urinary tract revealed no lesion other than a rather dense stricture of the right ureter. She experienced complete relief from proper treatment of this condition alone.

As to the pathology of ureteral stricture, much interesting material is gradually accumulating. Goldstein and Carson, in a recent study of 46 consecutive autopsies, found a 9 per cent incidence of ureteral stricture, all verified by microscopical study.

Hunner, in a recent personal communi-

cation, furnished the following facts from the exhaustive work done by Schreiber, of New York, in the Senkenberg Pathological Institute, connected with the Frankfort Hospital, in Frankfort, Germany. [See THE AMERICAN JOURNAL OF SURGERY, this issue, page 55]: In a series of 100 consecutive, unselected autopsies, on 42 men, 37 women and 21 children, he found a 12 per cent incidence of ureteral stricture. Of this 12 per cent, Schreiber considers 5 per cent as of congenital origin; he found that the majority of ureteral strictures occur in the lower pelvic portion and are the result of local inflammatory disease in the pelvis, rather than of distal focal infections.

Hunner, on the contrary, has consistently clung to the conception that the ureteral lesion originates, most often, from remote foci of infection; that it is frequently laid down in childhood and is concurrent with a pyelitis or pyelonephritis; that the pyelitis cleared, the ureteral lesion lying dormant, oftentimes, for years, subsequently to be lighted anew by some intercurrent infection, or by pressure from without, as in the pyelitis of pregnancy.

The chagrining aftermaths which are likely to ensue when undue haste or lack of study has led to unnecessary attack upon appendix, reproductive, or other organs, have been pointed out by me in previous contributions on this subject; suffice it here to say that only by the most discriminating study are many of these mistakes to be avoided.

Accumulating experience has shown that ureteral strictures, in their response to treatment, behave much like narrowings encountered in other tubular structures within the body, such as the urethra or esophagus. That is to say, when recognized and treated in the earlier stages, prior to the formation of dense scar tissue, the results are both gratifying and permanent. In cases that have been allowed to drift for years, the treatment, of necessity, is more prolonged and, to insure proper drainage for the kidney above, should be

repeated at varying intervals over a period of several years.

This factor of drainage must never be lost sight of; it is the essence of success in eradicating kidney infection. My present practice is, in the very old and very chronic case, to apply dilatation and lavage at intervals of ten days to two weeks, until the infection has disappeared; and, upon the completion of this preliminary treatment to insist that the patient return at regular intervals—two or three months—for ureteral dilatation. The andrologist, through long years of experience in dealing with urethral stricture has learned that only by periodic dilatation can such lesions be kept symptom-free, and it would seem but logical to apply the same reasoning to ureteral obstructions.

The following cases, briefly recited, together with the pyelographic findings, will serve to elucidate some of the interesting points of ureteral stricture work:

CASE 1. Mrs. W. C. B., aged fifty-four, quartipara, was first seen May 25, 1924. About twenty-five years before she had several attacks of severe, left loin pain, with hematuria, the condition then being diagnosed as kidney stone, but no recollection is had of passing stones per urethram. Since that time has had, at irregular and varying intervals, many attacks of a similar nature, some of them so severe as to require morphine for relief.

Ten days prior to first examination she experienced one of her attacks, since which time she has been confined to bed and pain has been almost constant.

*Catheterized Bladder Urine.* Few pus cells, no red blood cells; trace of albumin.

*Roentgenogram.* No stones in bladder, or in either ureter or kidney.

*Cystoscopy.* Bladder and ureteral openings appeared practically normal. No. 6 catheter carrying  $4\frac{1}{2}$  mm. bulb 10 cm. from its tip, was passed into the left ureter, where bulb "hangs" in tight area about 3 cm. above bladder and cannot be made to pass on further. Pelvic capacity 30 c.c. The urine from left kidney shows: Pus, 1 plus; few red blood cells.

*Pyelogram.* Dilated renal pelvis and upper ureter and two strictured areas: one near the

pevic brim and one just above the bladder (Figs. 1 and 2).

At subsequent treatments, the lower obstruction was dilated to 5 mm. but this bulb could never be passed through the upper stricture. Following these dilatations complete relief was enjoyed for one and one-half years when, following a long motor trip (a frequent aggravator of ureteral lesions), the patient experienced a return of the acute symptoms. During this attack, not even a filiform bougie

ing the establishment of free drainage; and the necessity of persistence in treatment in order to keep the lumen patent.

CASE II. Mrs. T. R. B., aged thirty, began to have trouble with the bladder ten years ago, voiding every one or two hours by day and three or four times by night. In addition, had attacks every two or three weeks in which the vesical irritability was marked and the desire to void constant. For the past year has been

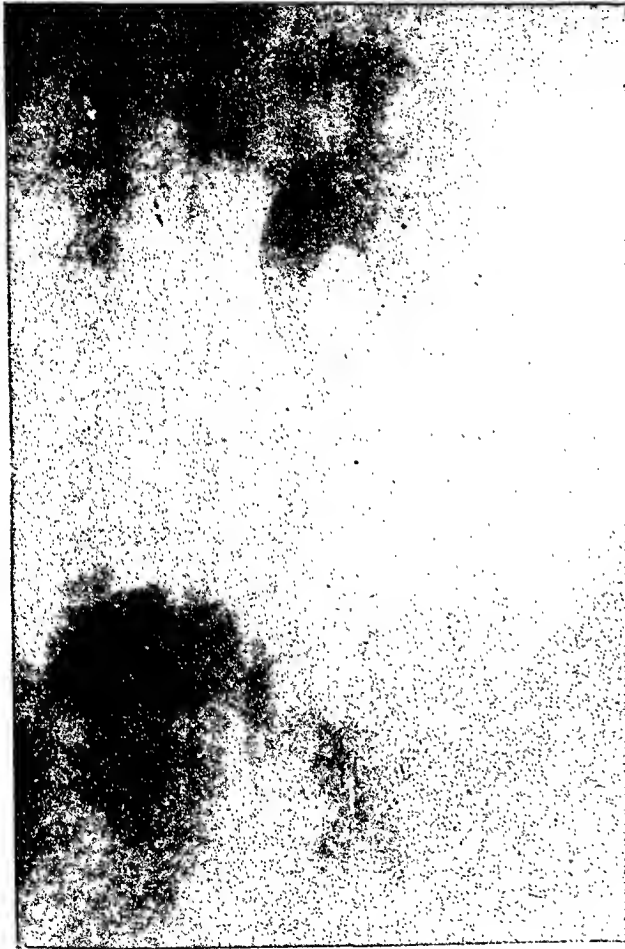


FIG. 1.

could be coaxed through the lower obstruction; six days later, after subsidence of the acute condition, a No. 6 catheter was passed all the way to the kidney and two weeks later, a No. 8 catheter armed with  $4\frac{1}{2}$  mm. bulb got by both obstructions. The urine from the left kidney is now pus-free and the patient is completely relieved of all symptoms.

This case presents several interesting features: the great length of time over which the lesion has persisted; the irregular periodicity of acute attacks, mimicking stone; the prompt disappearance of the overhead infection follow-



FIG. 2.

under the care of an internist, with no perceptible improvement.

*Physical Examination.* Right kidney tender, somewhat enlarged and slightly movable, with marked tenderness over the ureter at the pelvic brim. Left kidney negative.

*Roentgenograms.* Negative for stone.

*Pyelogram.* A rather small pelvis and three calyces with no deformity, but arranged in daffodil-like fashion; in the ureter a definite narrowing at the point of hang of bulb at pelvic brim (Fig. 3).

*Cystoscopy.* Bladder reveals no evidence of tuberculosis or ulcer, but a congested trigone and a small pouting right ureteral orifice; No. 8 catheter with  $4\frac{1}{3}$  mm. bulb passes with difficulty and reveals, on removal, tight hang of bulb at pelvic brim. Pelvic capacity 5 c.c.

Catheterized bladder urine: few pus cells; no red cells; no albumin. Urine from right kidney: few pus cells; few red cells.

The relief afforded by the treatment of the stricture alone, without the addition of any other therapy, was immediate and pronounced and serves well to illustrate the point made above that ureteral lesions frequently reflect their distress signals into the bladder.

CASE III. Mrs. W. H. B., aged thirty-three, unipara. Two weeks after the birth of her first and only child, eight years ago, she had chills,



FIG. 3.

fever and cystitis; since that time she had suffered with constant pain in the left loin and along the ureter. Six years ago was operated upon for appendicitis and removal of right ovary without relief. When first seen she was having a severe attack of left loin pain simulating renal colic with the history of having had many similar attacks during the preceding three or four years.

*Physical Examination.* Negative except for marked tenderness over the left kidney and over the ureter at the crossing of the pelvic brim. The urine showed only an occasional pus cell, no red cells.

*Roentgenogram.* Negative for stone.

*Cystoscopy.* Bladder normal; No. 7 catheter with 4 mm. bulb located definite obstruction 4 cm. above bladder.

*Pyelogram.* Fairly normal in outline with capacity of 5 c.c.; lower ureter showed definite stricture at the point of häng of the bulb, 4 cm. above bladder (Fig. 4).

Prompt relief was had from four dilatations of the stricture.



FIG. 4.

CASE IV. Mrs. J. G. S., aged fifty-four, sextipara. First seen November, 1922. For sixteen years had had continuous trouble with the left side and loin. She had many acute attacks of severe pain with bleeding and for three years has been almost an invalid because of their severity and frequency. The symptoms point strongly to either stone, tumor or tuberculosis.

*Physical Examination.* Left kidney somewhat enlarged, lower pole palpable and tender, with tenderness along entire course of ureter. Right kidney negative. Abdominal walls much relaxed and flabby. Bladder urine: pus, 4 plus; red blood cells, 4 plus; albumin, 1 plus.

*Roentgenogram.* Entirely negative for stone, tumor or tuberculosis.

*Pyelogram.* Pronounced dilatation of left renal pelvis with 30 c.c. capacity; upper ureter markedly dilated with definite obstruction 4 cm.

above bladder, which point is located by hang of wax bulb in this portion of ureter (Fig. 5).

This patient received four treatments, dilating the ureter to  $4\frac{1}{2}$  mm. bulb and she was fitted with a proper abdominal supporter. At the time of discontinuing the treatment, the urine was pus-free and blood-free, with marked relief of all symptoms. Request to report in three months was not complied with and no later report is available.

over the right ureter at the pelvic brim. Left kidney negative.

Catheterized bladder urine: pus 2 plus; a few red cells, trace of albumin. Urine from right kidney: pus, 1 plus; few red cells; no albumin.

*Roentgenogram.* Right kidney somewhat low; no evidence of stone.

*Pyelogram.* Calyces normal in outline; slightly dilated pelvis; ureter dilated above obstruction 3-4 cm. above bladder (Fig. 6).



FIG. 5.

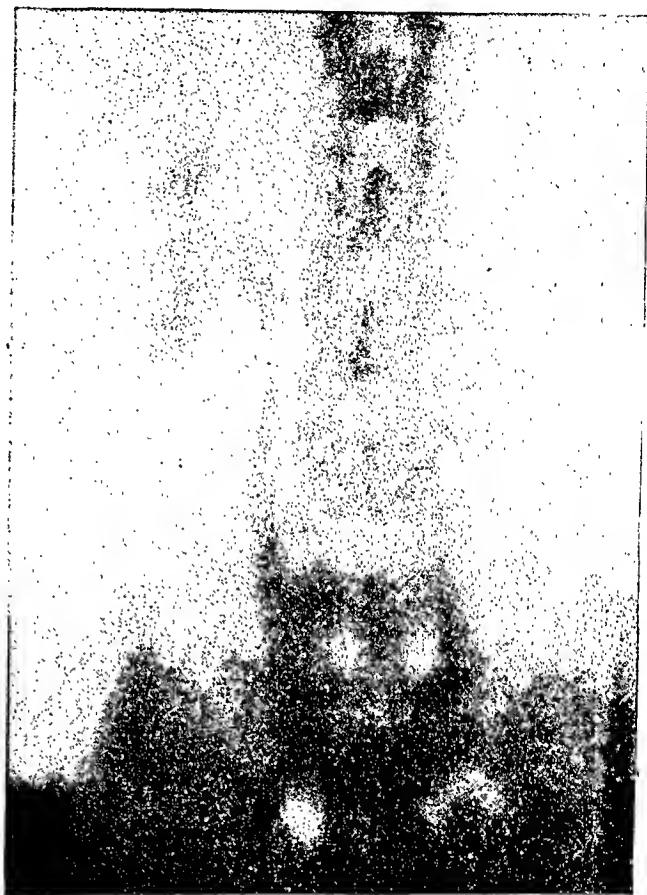


FIG. 6.

CASE V. Mrs. H. L., aged fifty-seven, quartipara, first seen August, 1924. Her trouble began ten years before with vague right loin pain, reflected forward along the course of the ureter down to the bladder and with vesical frequency and irritability.

No history of definite, acute attacks of abdominal pain which might be interpreted as appendicitis, cholecystitis, or pyelitis. For past three months the discomfort has been constant, accompanied by persistent pyuria, not yielding to bladder irrigations.

*Physical Examination.* Rather large and fleshy with tender, palpable, somewhat enlarged, right kidney and marked tenderness

*Cystoscopy.* Congested base and trigone; right ureteral orifice small and pouting; a 4 mm. bulb passes with difficulty through the obstruction about 4 cm. above the bladder corresponding to the narrowing shown in the pyelogram.

A rather stormy reaction followed this instrumentation, reproducing in aggravated form all of the old symptoms and pain.

In cases in which pronounced reactions occur, experience has shown that there should be no repetition of treatment until all the acute symptoms have entirely subsided; usually three to four weeks.



CASE VI. Mrs. H. B., aged forty-three, nullipara. Six years ago had acute attack of cystitis (?) lasting one week; two years ago had severe attack of pyelitis, with chills and high fever, lasting for two weeks. Since this attack has had constant pain in back, more pronounced on the left side, with a loss of 26 pounds in weight. Nine years ago suspension of uterus, removal of appendix and right ovary.

*Physical Examination.* Lower thorax con-

area, and a second pyelogram was made (Figs. 7 and 8).

This case illustrates the importance, if one wishes really to demonstrate ureteral twists and renal stasis, of having at least one exposure with the catheter brought well down into the ureter, so that there is no "splinting" at any point of the drainage canal. With the omission of this point in the roentgenographic technique, one can readily see that pathologic processes may be missed.



FIG. 7.



FIG. 8.

tracted, with deep epigastric angle; general visceroptosis with both kidneys enlarged, movable and palpable. Marked tenderness over both ureters at pelvic brim. Catheterized bladder urine: Pus, 1 plus; no red cells, no albumin.

*Roentgenogram.* Negative for stone; both kidneys low-lying.

*Cystoscopy.* No. 8 catheters, armed with 5 mm. bulbs and passed at different times, reveal obstruction in both ureters in broad ligament area, 3 or 4 cm. above the bladder; pyelograms first made with catheter well up to kidney, after which, the catheter was drawn down until the bulb obstructed in the tight

Many such cases as this one, in former years, were promptly subjected to one of the numerous varieties of kidney anchoring operations; and sometimes, with marked relief of symptoms; the reason being that better kidney drainage was established from above.

Now, many of these cases have been shown to have obstructive lesions also at one or more points within the ureter and may be more safely and conservatively handled by ureteral dilatation and proper abdominal support. Obstruction at the ureteropelvic juncture, caused by an aberrant vessel or from adhesive constrictions, calls, of course, for the proper surgical measures.

# THE AFTER-TREATMENT OF FRACTURES ABOUT THE ELBOW

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IN the evolution from quadruped to biped posture, the lower extremities take up the burden of weight-bearing and locomotion, while the upper extremities assume the duties of body servants. It therefore becomes evident that in repairing any injury to the lower extremities, we have to bear in mind the ultimate stability necessary for locomotion, while our goal in the treatment of injuries to upper extremities should be that of full range of motion.

The most common serious injury to the extremities is a fracture. The most common fracture in older people is one about the hip joint, in adult life the fractures about the wrist, and in children, by far the most common fracture is that about the elbow joint. As is well known, non-union and delayed union are not uncommon after fractures of the weight-bearing lower extremities, while non-union in fractures about the shoulder joint, elbow joint or wrist joint is extremely rare. Limitation of motion following fractures about the joints in the upper extremities is, however, very common and assumes a greater importance than the same limitation in one of the joints of the lower extremities, because more people earn their living with the help of the upper extremities than with the help of the lower extremities.

In an orthopedic hospital, the patients with limitation of motion in the elbow joint following a fracture reach a very high percentage, and the number of such fractures admitted to the Hospital for Ruptured and Crippled during the year 1925 was 100 out of 828, which represents the total of fractures admitted during the same period.

We have taken for our material 100

successive cases sent for after-treatment to the Department of Physical Therapy of the Hospital for Ruptured and Crippled.

Fourteen cases had open reduction. Of complications encountered, we had two cases of myositis ossificans, one of which was discharged with 87.5 per cent normal function; the other one was discharged with 81.9 per cent normal function. No cases of myositis ossificans or Volkman's contracture, admitted as such to the hospital, are included in the series. One case developed arthritis and was discharged with 88.8 per cent of normal function. The series includes 5 cases with nerve involvement. The radial nerve was involved in 1 case and the ulnar nerve was involved in 4 cases. These nerve lesions did not show any R.D. and all recovered in from five to nine weeks except the case with the radial nerve involvement, which persisted for six months.

Sir Robert Jones has laid down the generally accepted rule for the emergency treatment of these fractures. He thereby changed the medical profession's attitude toward fractures about the elbow from one of fear to one of assurance. Sir Robert Jones' "Golden Rule of Treatment" says, "They should all be treated with the elbow fully flexed and the forearm supinated with the single exception of fracture of the olecranon, which requires full extension." This treatment is so generally known that few doctors, be they general practitioners or specialists, pass up the opportunity of treating a fracture about the elbow. The after-treatment, however, is little understood.

These are the facts that have prompted us to make this study of the after-treatment and, although it applies to fractures about the elbow in particular, the general



rules may probably be applied to the after-treatment of fractures in general.

TABLE I  
AGE

	Per Cent
From 1-10 years.....	66
From 10-20 years.....	27
Over 20 years.....	7

TABLE II  
SEX

	Per Cent
Males.....	89
Females.....	11

Table I and Table II only bring out two well-known facts about these fractures, i.e., they are most common in children and more common in boys than in girls.

# ANATOMY

The bones taking part in the elbow joint develop from not less than seven centers of ossification. It is really a joint with three articulations; one between the humerus and radius, the second between the humerus and ulna and the third between the radius and ulna. Due to the difference in size between the articulating surfaces of the capitellum and the trochlear and the obliquity of the latter, the axis of the extended and supinated forearm is not in the same line as the axis of the humerus. Thus the carrying angle is produced for the purpose of clearing the forearm from the pelvis and therefore the carrying angle is most marked in the female.

The lateral and medial epicondyle serve as origin for the flexors and extensors of wrist and fingers, and the olecranon is the insertion of the strong triceps and this accounts often for the separation of fragments after fractures about the elbow.

It is also of importance to remember that the very delicate movements of hand and fingers are dependent on the integrity of supination and pronation of the forearm which can only take place with a freely movable radioulnar joint.

Table III shows that 50 per cent of our cases did not come for after-treatment until more than one month had passed.

Table v brings out the fact that there is a direct relation between the length of time from reduction to beginning of after-treatment, and the number of treatments required to produce the maximum results. The average number of treatments for a patient who comes for after-treatment in the first three weeks following reduction was 12.6, while the corresponding number of treatments for a patient who presents himself after one month was 23.

TABLE III

FREQUENCY OF SITES INVOLVED			
Supracondylar.....	22	Upper radius.....	8
Int. condyle.....	10	Epiphyseal sep. of hum.	7
Ext. condyle.....	21	Epicondylar.....	1
Olecranon.....	1	Upper ulna.....	1
Interecondylar.....	2	Dislocations.....	5
Capitellum.....	1	Not classified.....	21

TABLE IV

TIME WHEN AFTER-TREATMENT WAS BEGUN

	Per Cent of Patients
First week.....	2
Second week.....	15
Third week.....	20
Fourth week.....	13
More than one month.....	50
	100

TABLE V

NUMBER OF TREATMENTS IN RELATION TO TIME BETWEEN REDUCTION AND AFTER-TREATMENT

	Per Cent of Patients	Number of Treatments
First week.....	2	10
Second week.....	15	13
Third week.....	20	15
Fourth week.....	13	19
More than one month.....	50	23

TABLE VI

AVERAGE GAIN OF FUNCTION IN DEGREES COMPARED WITH TABLE IV AND TABLE V

	Percent of patients	Number of treatments	Per cent gain in function
First week.....	2	10	100
Second week.....	15	13	73.2
Third week.....	20	15	68.3
Fourth week.....	13	19	73.3
More than one month.....	50	23	64.6

In Table VI, we see that the average gain in function in degrees of range of motion in flexion and extension was 100

degrees in the early patient and 64.6 degrees in those who came more than one month after reduction.

If we analyze Table VI, it is undeniable that the time of immobilization in fractures about the elbow is responsible both for the length of the after-treatment and amount of gain in function obtained.

The question of how long we should completely immobilize these fractures is, therefore, forced upon us. The medical profession seems at great variance as to the answer, when some patients are sent for after-treatment the first week and others, 50 per cent of them, were completely immobilized for over one month.

#### AFTER-TREATMENT

The after-treatment of fractures in general usually suffers from insufficient attention of the surgeon, who is mostly interested in the reduction of the fracture and willing to take a gambler's chance on the functional end-result. On the other hand, the after-treatment is often turned over, with little or no instruction, from surgeon to more or less trained technicians.

Very able books on fractures have been published, but the few notes they contain about the after-treatment are hazy, often misleading, and the therapeutics advocated are empirical, to say the least.

Upon what shall we base the after-treatment of fractures? In this article, we shall attempt to give a short résumé of the physiological healing of a fracture, based on the most recent experimental work on the repair of bone. We will then show how one can synchronize the chronological bone repair with the application of physical means. What takes place when the continuity of a bone is destroyed by violence and how can we help the repair? For practical purposes, we will divide the answer to these questions into five stages.

*First Stage.* The immediate result of a fracture is a hemorrhage which is central, subperiosteal and muscular and may extend along fascia and subcutaneous tissue. This hemorrhage produces the

clinical symptoms of pain, swelling and muscular spasm. These three symptoms indicate clearly nature's attempt at immobilization and, after the best possible reduction has been accomplished, our efforts should be to maintain this reduction by effective, but not constricting, immobilization. The immobilization of the fragments is so important in this first stage of repair, that any attempt at relieving the pain, muscular spasm or swelling by gentle effleurage, as advocated by Lucas-Championnière, thereby jeopardizing the reduction, seems neither rational or safe.

*Second Stage.* A few hours after the fracture, a productive inflammatory process begins which, through the granulation tissue formed and the exudate of fibrin and serum, changes the hemorrhage into a hematoma. The clinical symptoms of pain, swelling and muscular spasm persist and they tell us to keep our hands off and maintain the immobilization.

*Third Stage.* Forty-eight to seventy-two hours after the reduction the blood clot surrounding the fragments is further organized by connective tissue that has grown in from the periphery. Osteoblasts appear on the stage and some bone matrix is formed from the intracellular substance. By this time, the pain and muscular spasm have disappeared and swelling decreased.

*Fourth Stage.* On the fourth or fifth day, we have a soft callus consisting of osteoid tissue. The calcium salts (calcium phosphates and calcium carbonates) are deposited in the connective tissue stroma of the perivascular areas. These salts are carried in the circulation by colloids and by carbon dioxide and are also available from the fractured ends of the bone by a process of demineralization and atrophy. The calcium phosphates and calcium carbonates are in solution in an acid media. It is, therefore, believed that the hydrogen-ion concentration becomes lowered, and when this reaches a certain point below that of the blood plasma, precipitation of the calcium salts occurs. If, at this stage, the splintage permits, it is easy

to see how the application of heat will help to restore the condition of the soft parts about the fracture. The physiological action of heat, however, also tends to lower the hydrogen-ion concentration of the blood and, therefore, is helpful in the precipitation of the calcium salts.

*Fifth Stage.* Between the second and the third week, the connective tissue is well organized and new blood vessels are seen. Osteoid tissue appears in the perivascular areas and there is a gradual transition in the appearance of the cells from connective tissue to osteoid tissue to bone.

The absorption of the excessive callus begins and there are signs of the re-establishment of the bone marrow.

At this stage, the patient often complains of stiffness in the shoulder, elbow and wrist joint and the soft parts about the fracture are described as being without life. Now we are dealing with a convalescing joint where the bony repair has gone on to a soft callus and there is no muscular spasm, swelling or pain which contraindicates manipulation.

By using these observations as a criterion for the after-treatment, it seems rational to fix the end of the second week after reduction as the beginning of the after-treatment. For anybody who understands this process of bone repair and who has any knowledge of and respect for the physiological significance of pain, it seems incredible that most surgeons dealing with fractures still prescribe massage of the elbow and passive motion for the after-treatment. Gentle massage of the soft parts above and below the elbow is of great value, but any massage about the joint and over the callus is of little or no help and may produce excessive callus and myositis ossificans. It is easy to conceive how massage will dislodge osteoblasts and spread them in the soft tissue and accelerate their growth or increase the transition of connective tissue cells or muscle cells into bone-producing cells. Therefore massage about elbow joint and in the vicinity of the callus is contraindicated.

Any attempt to regain the function of the elbow by means of forceful passive motion in a child screaming from pain, only adds another chapter to the history of inquisition, and the result obtained compares favorably with the results obtained by painful passive motion in the early treatment of fractures in children. If good results are obtained with massage and passive motion of the elbow, it only shows the wonderful compensatory power the human organism is capable of when exposed to insults by members of the healing art.

The after-treatment consisted in all our cases of external heat, internal heat by means of diathermy, massage and therapeutic exercises. It seems justifiable to review briefly the physiological actions of these physical means.

#### HEAT

The calorific or heat rays make up the red rays or the least refracted rays of the visible sun-spectrum and, also, the invisible infra red rays. In the electromagnetic spectrum, they are found to have a wave length of from 3800 to 9000 Ångström units. Other properties, beside refraction, are reflection, absorption, penetration and polarization.

When heat in any form strikes the human body, there is an increase of the surface temperature. To protect the body against any excessive increase of heat, the heat-regulating mechanism responds with a hyperemia. The capillaries are dilated, heart action is increased and the circulation accelerated. Thereby, some heat is carried into the systemic circulation and some is eliminated through the more rapid respiration. The sweat glands increase their activity and begin to eliminate and everything tends to keep the body temperature at a constant level. On application of heat, the musculature relaxes and the sedative effect on the sensory nerve-endings is well known and, probably, also acts reflexly on deeper structures.

The reaction of the sweat, saliva and

urine shows first increased acidity and later alkalinity. The reaction of the blood becomes less acid or alkaline as measured by the hydrogen-ion concentration.

The practical application of external heat may be divided into conductive heat and convective heat. Under conductive heat, we include all measures where the source of heat is in direct contact with the skin. Hot applications and the different forms of hydrotherapy belong here. The whirlpool bath, where the water under 50 lbs. pressure and heated to about 115°F. is led into a basin, producing a whirl, is the method to prefer. The cleansing effect of the water, the heat and the molecular massage of the activated water is of great benefit to a limb that has been encased in plaster for some time. However, as the rest of the treatment of the fractures can hardly be given in the hydrotherapy department, our patients were given whirlpool baths only the first week and, thereafter, the convective heat was used. This consists of exposing the patient to any source of heat at a distance from the body.

For this purpose, we make use of carbon filament incandescent lamps. They can be used on a stand with a reflector over the lamp to throw the heat rays parallel; or several lamps are mounted on a bridge or heater, incorrectly called "baker." This heater is put over the elbow, which is thus exposed for fifteen to twenty minutes.

In order to study the effect of various physical means on the peripheral circulation, we have made use of an intradermal injection of normal saline. Normal saline 2 minims was injected, intradermally, on the volar surface of forearm, 10 cm. below the elbow and this area exposed to various forms of heat. The absorption of this injection in normal individuals, without treatment, was determined at sixty minutes. When such an injected area was exposed to the whirlpool bath the absorption of the saline was determined at seventeen minutes; when exposed to a carbon filament lamp on a stand, 60 cm. from the skin, the absorption time was twenty-

five minutes and when using the heater with 12 carbon filament lamps, the absorption was accomplished in thirty-one minutes. This gives a rough estimation of the effect of external heat on the peripheral circulation. Even though much of the applied heat is absorbed and carried away by the blood stream, it is only rational to believe that some heat penetrates deeper, by means of conduction, in the tissue underlying peripheral circulation.

#### DIATHERMY

In addition to the conductive and convective heat, we speak of conversive heat, which means heat produced in the tissue by means of its resistance to a high frequency current, oscillating between two electrodes. The diathermy current used therapeutically has a voltage of 1000-10,000 and an amperage of 200-4000 milliamperes. The oscillations vary from 1,000,000 to 2,500,000 per second. These rapid reversals of the current prevent the occurrence of any chemical effects or any neuromuscular responses. The therapeutic value of diathermy is, therefore, based solely on the development of heat.

In applying diathermy to an elbow, we have three techniques to choose from. We may place the two electrodes on opposite sides of the joint or we may place the electrodes in the form of cuffs, one above and one below the elbow. The third technique consists of placing one electrode over the lower half of the triceps and an equal sized electrode over the volar surface of the forearm, just below the elbow. The first-named method has been used by us, and the average size of the electrodes was 4 × 8 cm. The contact surface was moistened by warm soap-lather and the electrodes held in place by rubber bandages. It is safe to send 1000 ma. through these electrodes, but any rule as to the dosage of diathermy should be governed by the tolerance of the patient. With the spark gaps closed, the current is turned on slowly and then the spark gaps are opened till the millimeter reads 300-400. This is

gradually increased, until, after about two minutes, the milliammeter reads the dosage desired. This is maintained for about twenty-five minutes and the current is turned off gradually.

Although the question of where the maximum heat is produced is not settled, it cannot be denied that heat is produced in the path of the high frequency current. This is especially true, when we deal with electrodes of the size mentioned above, where the distance between the electrodes is usually less than 10 cm. and the amperage varies from 500–1000 milliamperes, with the relatively higher voltage delivered by the latest diathermy machines. This secures a high current density. By current density is meant the amount of electrical units per square section of the medium, and this current density is a necessary factor in the production of converse heat.

The intradermal saline test gave us a reading of thirty-two minutes.

#### MASSAGE

Sir Robert Jones has said that the value of massage is too well established to require defense, but it cannot be denied that many of the ideas prevalent as to its methods of use are often vague, and surgeons who have made a close enough study of the subject to give definite directions to a masseur are still fewer than they should be.

The main physiological effects of massage are:

1. Assisting the circulation.
2. Aiding the movement of lymph.
3. Exerting tension on some structures which we hope to free or stretch.

The absorption time of intradermal saline, when treated with massage, was ten minutes, compared with sixty minutes for the untreated injection.

Championnière has studied the histological changes that take place when soft tissues are crushed. He found:

1. Dissociation into fibrillae of muscular fibers, as shown by well-marked longitudinal striation.

2. Hyperplasia, sometimes a simple thickening of the connective tissue.

3. Increase in places of nuclei in connective tissue.

4. Interstitial hemorrhages.

5. Enlargement of blood vessels with hyperplasia of their adventitious coats.

6. Multiplication of nuclei in the sarcolemma, resembling interstitial myositis.

When massage was applied to these tissues, he found the following histological picture:

1. Muscle appeared normal.

2. No secondary fibrous bands separated the muscle fibers.

3. No fibrous thickening around the vessels.

4. General bulk of muscle was greater.

5. There was no sign of hemorrhage.

The therapeutic application of heat produces a loss of acid or an alkalosis as mentioned above. The acid base equilibrium also undergoes striking changes in exercises, as shown by Barr and his co-workers. The result in exercises being an acidosis, due to the production of lactic acid and  $\text{CO}_2$ .

The effect of massage on the body fluid reaction, according to Pemberton, is a restoration to normal. The application of massage should be left to technicians chosen for their skill rather than their personality. Supple and warm hands, with an educated sense of touch, are preferable to great strength. Any hard massage that calls forth a protective contraction is an error in technique. A good way of judging a technician is by the way she places the patient for the treatment. The patient should be in a position that permits the utmost possible relaxation and that is the recumbent position. This applies to the treatment of the upper extremities as well as any other part of the body. The kind of lubricant a technician uses usually shows her experience. For any normal skin, a lubricant with a fatty base is best, but when a skin shows tendencies to eruptions about the hair follicles, a soft powder is preferable. As mentioned above, massage

should not be used about the callus in fractures about the elbow, but is of great value above and below the elbow.

#### THERAPEUTIC EXERCISES

The physiology of exercises or muscular contractions may be reviewed as to their

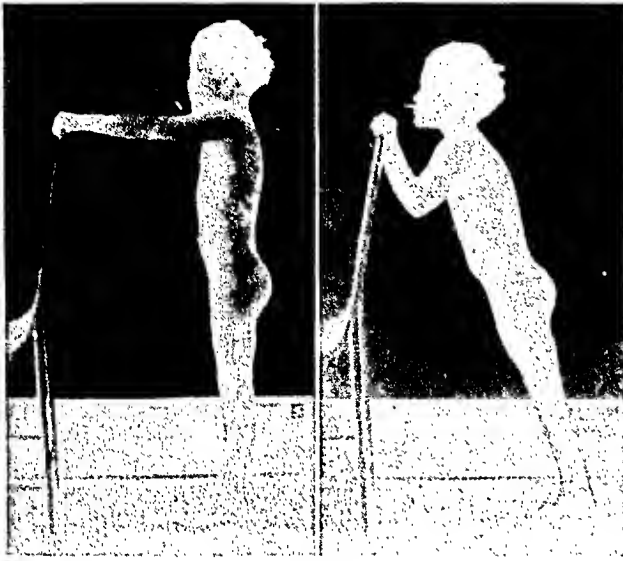


FIG. 1.

local and general effect, but in relation to fractures about the elbow only the local effect is of interest to us. In order to get a

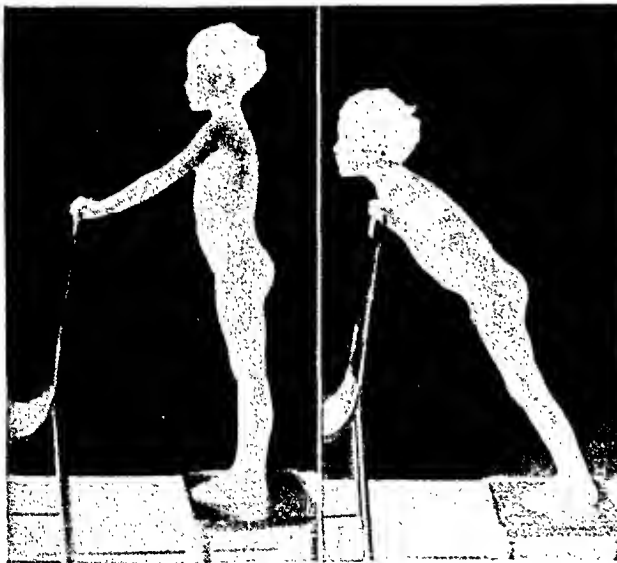


FIG. 2.

muscular contraction, we must have nerve stimuli, the contractility of muscle fibers and the fuel of carbohydrate and fat. The physiology of muscular contractions may be divided into.

1. *Mechanical*, which is produced by means of approaching the muscle's origin and insertion on skeletal parts, which act as levers.

2. *Metabolic*. The muscle utilizes carbohydrate and fat for its contraction, leaving as waste products lactic acid and  $\text{CO}_2$ , which are probably responsible for muscle fatigue. Protein is mainly repair material.

3. *Thermal*. An increase of temperature always follows muscular contractions.

4. *Electrical*. There is some change in the electrical potential of the muscle, preceding and following the contraction.

5. *Functional*. By systematically continued muscle contractions, there is an increase of volume, tonicity and power of the muscle.

In the after-treatment of fractures about the elbow, we make use of the mechanical effect of muscle contractions, because of their pull on the skeleton, in order to prevent or correct deformity.

Sir Arthur Keith has formulated the relative function of muscles and ligaments of a joint, when he says: "Ligaments come into action only when the normal muscular

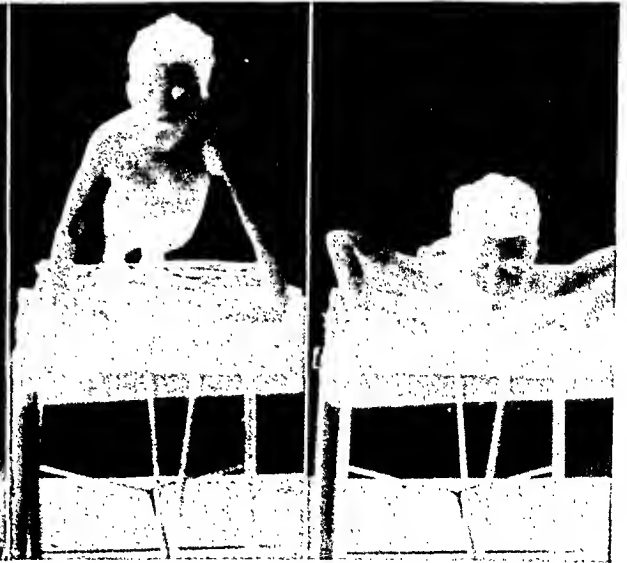


FIG. 3.

support and defense of a joint has broken down." When we realize the physiological truth in this statement, we can understand how irrational it is to advise a patient with a flexion deformity of the

elbow as follows: "Go home and carry a heavy weight in your hand, and the elbow will straighten out." The patient carries the weight as long as the flexor muscles of the elbow permit and then drops it. If he is conscientious, he repeats it often and develops strong elbow flexors, which only increases the deformity by counteracting gravity, which, if left alone might have corrected the deformity.

Exercises may be divided into active, passive and resistive.

By active exercises, we mean voluntary contractions of muscles by the unassisted patient. During the first week of treatment, the patient goes through the motions of elbow and forearm to the best of his ability.

Passive exercises comprise exercises performed on the patient by means of apparatus or by a technician. As mentioned elsewhere, these forcible manipulations of the elbow do not belong in modern therapeutics. They are unphysiological, the benefit from them is very questionable and they may produce a myositis ossificans.

Resistive exercises are performed by a technician in cooperation with a patient, or by the patient herself, using her body weight or some apparatus for resistance. In the second week of treatment, these resistance exercises can be started. If the biceps is contracted in an attempt to flex the elbow, the inner and outer head of the triceps will contract in elongation, but if resistance is offered to flexion of biceps, the triceps will relax instantaneously. The type of exercises used in our after-treatment is shown by Figures 1, 2 and 3. The principle is to apply the partial body weight in increasing amount to the elbow in maximum flexion. Again, when elbows are extended against the body weight, the triceps are strengthened, which will promote extension of the elbow. These exercises are to be repeated to the point of fatigue.

It is evident that any treatment such as we have attempted to outline has its limitations. It can be given only in a well-

equipped department of physical therapy. It is practical to give such a treatment only once a day or every other day. That means one hour of treatment out of twenty-four or forty-eight hours of inactivity. As soon as immobilization is dispensed with, the patient begins his home treatment, consisting of the exercises shown in Figures 1, 2 and 3. These are repeated every three hours.

TABLE VII

## END-RESULTS

End-results expressed in per cent of normal function

Time of immobilization before after-treatment began	100-90	90-80	80-70	70-60	60-50	50-40	40-30
1st week.....	1	1					
2nd week.....	2	5	2	1	3	2	
3rd week.....	11	2	2	2	..	2	1
4th week.....	5	6	..	..	2		
More than one month.....	14	10	6	10	6	2	2
Total per cent	33	24	10	13	11	6	3

The end-result was calculated as follows: If we take flexion to  $30^\circ$  and extension to  $180^\circ$  as normal, we have a normal range of motion of  $150^\circ$  of which  $60^\circ$  is flexion and  $90^\circ$  is extension. If we take the midposition of the forearm as  $0^\circ$  we have complete pronation at  $90^\circ$  and complete supination at  $90^\circ$ . If a patient was discharged with flexion to  $45^\circ$ , extension to  $135^\circ$ , pronation to  $45^\circ$  and supination to  $90^\circ$ , we may say that flexion was 75 per cent of normal, extension 50 per cent of normal, pronation 50 per cent and supination 100 per cent. This gives us a collective end-result of 68.75 per cent of normal. Our end-results compare favorably with other reports on fractures about the elbow, although the comparison suffers from the difference of opinion in interpreting perfect, good, fair and poor result. König, reporting roentgen-ray findings three years after the fracture about the elbow, makes the statement that in children even marked deformities disappear. It therefore seems rational to base the end-result on function alone.

Neuhof and Wolff studied 100 cases and reported perfect result in 53 per cent.

Ritter and his co-workers report about the same functional end-result percentage.

In our series 20 per cent of the patients

## CONCLUSIONS

Our study leads us to believe that the immobilization of fractures about the elbow, carried on more than one month, is responsible for longer after-treatment and,

## THE HOSPITAL FOR RUPTURED AND CRIPPLED

PHYSIOTHERAPY DEPARTMENT			
DATE: <i>MARCH 6 '27</i>		NAME: _____	
DIAGNOSIS: <i>FRACTURE OF EXT. CONDYLE LT. ELBOW.</i>		NUMBER: _____	
ELECTROTHERAPY			
GALVANISM	TIME	PART	STRENGTH
CONTINUOUS-IONISATION			
-POLE TO		+POLE TO	
INTERRUPTED			
FARADISM			
BRISTOW-COIL			
SINUSOIDAL			
SLOW-MED.-RAPID			
HIGH FREQUENCY			
<i>3</i> DIATHERMY	<i>25'</i>	<i>LT. ELBOW</i>	<i>500 MA</i>
ODIN			
AUTOCONDENSATION			
GENERAL-LOCAL			
STATIC			
WAVE			
SPARK			
BRUSH OR BREEZE			
HYDROTHERAPY			
CABINET			TEMPERATURE
SCOTCH OUCHE			
<i>1</i> WHIRLPOOL	<i>15'</i>	<i>LT. ELBOW</i>	<i>115°</i>
HELIO-THERMOTHERAPY			
<i>2</i> RADIANT LIGHT			DISTANCE
<i>2</i> <del>RADIANT</del> HEATING	<i>15'</i>	<i>LT. ELBOW</i>	
DEEP THERAPY LAMP			
ULTRA VIOLET			
AIR COOLED			
WATER COOLED			
MASSAGE			
<i>1</i> GENTLE-MED.-DEEP		<i>LT. UP. EXT. EXCEPT ELBOW</i>	
VIBRATION			
MECHANOTHERAPY AND GYMNASTICS			
<i>5</i> ACTIVE <i>✓</i>		<i>FLEX, EXT. SUP. PRON. LT.</i>	
PASSIVE		<i>ELBOW.</i>	
MEDICAL GYMNASTICS			
ZANDER			

SM-10-26

*Hansson* M.D.

FIG. 4. The therapeutic card used at the Hospital for Ruptured and Crippled. (1), (3) and (5) comprise the treatment the first week; (2), (3), (4) and (5) comprise the treatment from the second week on.

had been first treated in other hospitals and 15 per cent were sent in from private doctors. It is evident that these cases represent failures or they would not have been sent to an orthopedic hospital. Of our 100 cases, 14 had open operations.

usually, incomplete return of function. The question of when to start the after-treatment, therefore, comes up, and we have tried to answer this, by using the physiological bone repair as a criterion. This should suggest the end of the second week after



the time of reduction, as a safe time for the beginning of the after-treatment.

We further believe that:

1. Massage and passive motion of the elbow are contraindicated, because they are unphysiological and may produce myositis ossificans or, at least, excessive callus.

2. Early application of heat and active motion to the injured part promotes early functional restoration.

3. The after-treatment should not be entrusted to technicians without supervision. It should include physical means, the physiological action of which is well understood and well conducive to nature's way of healing and restoration.

4. Any treatment by physical means that may require one hour out of every twenty-four or forty-eight hours is insufficient and of little avail, if it is not followed up by some home exercises, which can be repeated every two or three hours.

5. In spite of best efforts at reduction as

well as after-treatment, about 10 per cent of the fractures about the elbow will show poor end-results.

#### BIBLIOGRAPHY

1. BANCROFT, F. W. Quoted in Scudder, C. L. The Treatment of Fractures. Phila., 1926, p. 913.
2. BARR, D. P., and HEMWICH, H. E. Changes in acid-base equilibrium following short periods of vigorous muscular exercises. *J. Biol. Chem.*, 1923, IV, 305.
3. HOWELL, W. H. Text-book of Physiology for Medical Students and Physicians. Ed. 9. Phila., 1924.
4. JONES, SIR ROBERT. Injuries to Joints; London, 1918, p. 87.
5. KLEIN, SIR ARTHUR. Menders of the Maimed. London, 1913.
6. KÖSIG, F. *Arch. f. klin. Chir.*, lxxxv, 187.
7. LUCAS-CHAMPAGNON, R. Traitement des fractures par le massage et la mobilisation. Paris, 1910, xxi.
8. MESSERLE, J. B. Massage, Its Principles and Practice. Ed. 2, New York, 1920, xvi.
9. NEUBOR, H., and WOLFF, H. F. The end-results of treatment of one hundred cases of fracture of the elbow. *Surg., Gynec. & Obst.*, 1915, xx, 295.
10. PEMBERTON, R. *Am. J. M. Sc.*, 1923, clxvi, 833.
11. RITTER, H. H. et al. Fractures about the elbow joint; review of 150 cases; end results in 52 cases. *J. Am. M. Ass.*, 1926, lxxxvi, 680-683.



# AN IMMOBILIZING CAGE

## FOR THE TREATMENT OF BURNS AND SKIN GRAFTS\*

A. J. HOSMER, M.D., F.A.C.S.

SALT LAKE CITY

THE object of this communication is to emphasize the importance of a therapeutic principle, and a mechanical agency for carrying it into effect, in the management of burns and other injuries resulting in the destruction of skin and requiring skin grafts. Although this principle and its agency are in aid and furtherance of accepted knowledge with respect to the pathology of burns and with respect to many of the remedial methods thus far employed, they seem, from a review of the modern literature, to be novel. No use seems to have been made of the mechanical agency in question and the principle itself is only incidentally and casually recognized in the literature. The principle is that of immobilization. The agency is an "immobilizing cage" consisting of heavy (No. 8 gauge) wires strung between and set into plaster casts adjusted to portions of the body on opposite sides of the burned area, in such a manner, as shown by the accompanying pictures, as to result in what may be called a skeleton cast, causing a complete fixation or immobility of the affected area and giving aid to recovery and treatment, both because of immobilization as such and because of certain resultant conveniences in and opportunities for treatment afforded by the cage.

A survey of the literature with respect to the treatment of burns and skin-destroying injuries and with respect to the application of skin grafts shows a substantial unanimity of opinion upon a number of factors and problems. One of the problems involved is pain, with its accompanying psychic shock. In skin cases, pain is caused largely by two things: One of these is movement of the affected part or area,

including both movement of the part or area as a whole by bending, and movement by contraction of the underlying muscles. The other is the application and removal of dressings.

A second problem is that of disturbance of the reparative process (briefly commented upon below) as a result of which the graft does not "take." This disturbance of the reparative process is, again, due to motion. This breaks up the delicate new circulation and loosens or separates the two raw surfaces—the granulating surface and the under surface of the implanted skin. The base may be suitable and the graft perfect, but movement of either, or underlying movement disturbing both, will spell failure.

A third and serious problem in connection with the treatment of burns, a problem especially met in burns of the third and fourth degree, is that of contractures, with consequent deformity and sometimes destruction of the usefulness of the affected part. Recent literature is also agreed that raw burned surfaces heal more kindly and quickly if exposed to the air and to natural light, and some authorities endorse the use of artificial light, claiming that it not only helps to keep the wound sterile, but that it lessens pain. And certainly we are all agreed that "the old method of applying solutions, ointments and dressings, only to tear them off from day to day, with consequent destruction of Nature's repair work, and with attendant nerve-racking pain and discomfort," should be improved if possible. The use of tannic acid in a 2½ per cent to 5 per cent aqueous solution, applied frequently (preferably every half hour) by spraying, the frequency of its

\* Read before the Salt Lake County Medical Society.

application to be diminished as soon as the burned section is seen by its brown color to be well tanned, is now recognized, and its advantage over such drugs as picric acid and such agencies as paraffin is established. Edward C. Davidson, who first used tannic acid in the treatment of burns and whose paper<sup>1</sup> is worthy of study by every medical man, has shown by his research the advantage of tannic acid treatment of burns over other methods in general use. His review of the pathology appears to prove that the constitutional reaction occurring after burns is due mostly to a toxic substance formed by the burned tissue.

We cannot remove the dead tissue mechanically with safety except where the burned area is small, though in some cases where the burn is deep and the surface small this is advisable, followed at once by skin graft. Tannic acid, when properly applied, produces a local coagulation of the devitalized tissue where the burn is superficial and thus prevents reabsorption. It precipitates, that is, makes solids of, the poisonous burned tissue. Solids are not absorbed. Davidson says:

It is believed that lessening of the toxemia should be attributed to precipitation of the toxic material of the burned tissue by the tannic acid applied, since such explanation is in keeping with all of the observed effects produced in vitro. The maintenance of local tissue dehydration by direct exposure to the air is probably an important factor during the early period of treatment. This not only prevents loss of body water but would appear to keep the toxic material out of solution. This explanation is strongly suggested by the cases in which symptoms of acute toxemia develop promptly following the application of moist boric acid dressings to the dry and crusted surface. . . . It is worthy of emphasis that the analgesic effect of tannic acid is one of its most striking features.

There are many reports of series of cases treated with tannic acid since Davidson introduced it in 1925. Bancroft and Rogers<sup>2</sup>

of New York City report a series of cases and say:

Tannic acid seems to be the best method at present for the treatment of burns. It relieves pain, diminishes absorption of toxic products and makes the care of the patient much easier from all points of view.

Beck and Powers<sup>3</sup> of Cleveland, report a series of cases, and point out the advantages of tannic acid over other methods of treatment. They particularly emphasize the advantage of applying the solution by means of a spray, instead of by compresses, followed by exposure to the air.

We also know from our studies of burns that a deficiency of the chlorides is likely to occur so that, to use a lay phrase, the "blood gets thick." Here the liberal use of normal salt solution, either intravenously or in some other manner such as will thin the blood and add chlorides to it, is indicated.

For the first few days a graft lives upon the host's lymph. In other words, it is "parasitic." Hence the graft must be bathed in lymph, not blood; and the graft should be so spread out and adjusted to the surface of the host that it is bathed in this nutritive fluid. The graft may die from lack of lymph nourishment before the new blood supply is established.

After the first forty-eight hours it is the delicate budding capillaries that furnish nourishment to the transplanted skin, without which the transplant would die. It is evident that any movement which would displace the two opposing surfaces of the host and the graft would destroy these new delicate vessels, with the resulting death of the transplant.

From the brief preliminary discussion above of the factors and problems connected with the treatment of burns and skin-destroying injuries, and with the application of skin grafts, and from the above discussion of modern therapeutic methods and the physiology of the reparative process, it will be seen that the

<sup>3</sup> Beck, C. S., and Powers, J. H. Burns treated by tannic acid. *Am. Surg.*, 1926, lxxxiv, 19-36.

<sup>1</sup> *Surg., Gynec. & Obst.*, 1925, xl, 202.

<sup>2</sup> Bancroft, F. W., and Rogers, C. S. Treatment of cutaneous burns. *Am. Surg.*, 1926, lxxxiv, 1-18.

following are desiderata: (1) Immobilization, to prevent pain, to prevent contractures, and to prevent interference with the process of repair. (2) Discontinuance of dressings, to prevent pain, to prevent interference with the process of repair, and to make possible exposure of the affected area to the air and to natural and artificial light as remedial agents. (3) Ease or convenience in the application of tannic acid by direct spraying over the raw surface.

The cage shown in the accompanying photographs seems to meet these needs.

solution, or with Dakin's solution, either by spray or with wet gauze, so that the wound will clear up more quickly and odor will be prevented. If the burn is of the third or fourth degree, the immobilizing cage effectually prevents contractures and protects the immobilized parts so that after the sloughing tissue has come away by itself, or has been removed by the surgeon, and the granulating surface becomes suitable, skin grafts may be placed without further difficulty and with the assurance that the new skin, undisturbed by movement and change of dressings, will live if

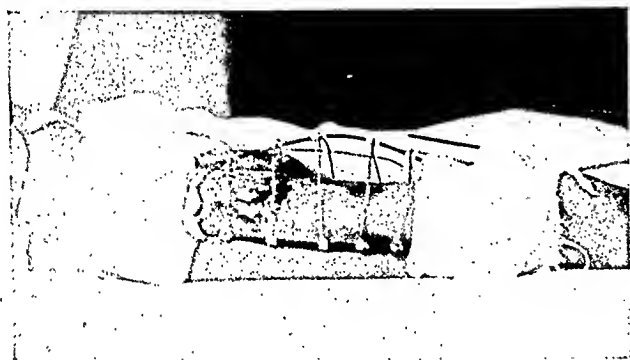


FIG. 1. Case I.



FIG. 2. Case II.

It produces complete immobilization, by preventing both bending of the injured part and movement of the underlying muscles; it dispenses with the necessity of dressings and gives direct and easy access to the burned surface for air, light, and the tannic acid spray. At the same time it conveniently and effectively prevents any foreign thing, for example the bed clothing, coming in contact with the wound.

The immobilizing cage should be applied as soon after the burn as possible, because as soon as it is in place and the parts are immobilized the pain stops and local treatment with tannic acid or light, without contact or dressings, may at once be commenced, without disturbing the patient. If the burn fortunately happens to be one of the first or second degree, it will then heal kindly under the crust formed, if tannic acid is used, and new skin will push off the dry crust. It may at times be expedient to moisten this crust with salt

properly applied. In deep burns of small surface the dead skin crusts should be removed immediately and skin grafts applied. In sloughing cases the grafts should be applied soon after the slough separates.

As well as other surgeons, I have for years used plaster of Paris and wire in cases of compound fracture, gun-shot wounds, etc. to fix the extremities and to make the open wounds accessible; and we have also used wire in places to secure strength with less plaster. But until comparatively recently I have not used these two common surgical aids for immobilizing and caging for burns and skin grafts; and, so far as I can learn, no other surgeon has made use of them for this purpose. The following two cases are selected from several to illustrate graphically the principle of immobilization and its application through the agency of a cage.

CASE I. G. C., male, aged 16 years, entered the Holy Cross Hospital at Salt Lake City,

Utah, August 30, 1926. The past medical and surgical history was negative.

Present history: The boy was horseback riding on August 24, 1926, when his horse fell and stepped upon him. The skin was torn from the inner and upper part of the right thigh, the injured area being about sixteen inches long and twelve inches wide. The denuded surface included much of the anterior and inner aspects of the upper part of the thigh and extended as far as the edge of the scrotum and included some of the skin of the buttocks. The detached skin had been carefully sewed back in place by the local attending physician, J. A. Hagan, of Gunnison, Utah, but when the patient entered the hospital six days after the injury, this enormous flap of skin was dead—a black, stinking slough. I immediately detached the silk sutures and removed the necrotic and sloughing tissue and applied warm boric acid dressings. Twelve days later, September 11, 1926, the wound being then free from sloughing tissue and looking clean and red, the boy was taken to the operating room and the immobilizing cage was put on as shown in Figure 1. Then, under anesthesia, Thiersch grafts were taken from the left thigh and applied to the denuded area. The grafts were applied direct, i.e., without putting them in salt solution, and the entire raw surface was covered. Pains were taken to be sure that the raw area to be covered was in suitable condition, that it was free from pus or any foreign substance, that the soil was suitable for the implanted tissue. Care was taken also in seeing that the implanted skin was smoothly and accurately placed, so that its undercut surface fitted closely on its entire area over the raw tissue surface.

No dressings were applied. A sterile sheet was wrapped about the cage for warmth during the night, but much of the time in the ward the wound was exposed to the air and light.

All the grafts grew except on two small areas, one on the buttocks and one near the scrotum, where the cage was defective and the bed sheet came in contact with the newly implanted skin. On October 9 these two small surfaces were again covered with Thiersch grafts, and the cage improved so as to prevent any contact. The patient was discharged from the hospital on October 26 with the whole of the injured area covered with healthy, substantial skin.

CASE II. M. H., male, aged four years, entered the Holy Cross Hospital at Salt Lake City on September 23, 1926. Past medical and surgical history negative.

Present history: On March 10, 1926, six months and thirteen days before entering the hospital, the boy, while in the yard playing with matches, started a fire. His shoe in some way became fastened between two pickets on a nearby fence and his clothing caught fire. The skin of his foot was protected by his shoe, but the skin on his entire left thigh and leg and over the buttocks and in front extending up to the ilium was entirely destroyed. The boy's clothes on the left side were burned off. His foot was finally liberated by the picket being burned away. The burn was of the fourth degree. He was treated by a local physician, with soothing dressings. His condition on entering the hospital was anything but promising. He was pale and frightened. His leucocyte count was 17,000. The burned thigh was flexed over the abdomen, with adhesions at the groin fastening the raw surfaces together. The leg was flexed on the thigh, with extensive adhesions fastening the raw surfaces together in the popliteal space. The enormous raw area of the entire member was covered with granulating tissue and was smeared with vaseline. It had a glazed, smooth surface and was comparatively free from pus or other exudate. The surgeon's first impulse in such a situation would be amputation at the hip joint. But there was no skin for a flap, and amputation would probably have resulted in death. Hence it was decided to attempt to save this little atrophied and deformed leg and cover it with new skin.

On September 24, the boy was anesthetized and put on the Hawley table. With steady, slow, careful extension, the leg was made almost straight, by breaking up the contractures. This necessitated the tearing loose of the adhesions at the groin and in the popliteal space, causing rather free hemorrhages, which were relieved by gauze pressure. I then applied the immobilizing cage. The patient was not greatly disturbed by this procedure; in fact from this time on he hardly complained of pain and, except as hereinafter indicated, he steadily improved in a general way. Through the cage I now applied to the glazed, granulating surface pieces of gauze wet in normal salt solution and these were kept

moist by spraying with the same solution. On account of the vast amount of skin required and the boy's condition at the time, it was impossible to attempt an autograft. Tests were made of his blood and it was unfortunately found incompatible with that of his mother (the boy was Type II, the mother Type IV), and also with that of any other of several available donors. Therefore, on September 29, in the ward and without giving either the mother or child any anesthetic, a few Thiersch grafts were taken from the mother's thigh and applied to the granulating surface of the child's leg just above the ankle and over the knee joint, to see whether the isografts would grow. They took favorably, and, therefore, on October 13, both the mother and child were anesthetized, and the extensive granulating surface was completely covered with skin taken from the mother. The knee joint and popliteal space were covered with whole skin or Wolfe grafts as follows: A piece of whole skin about 5 inches wide and 12 inches long, tapering at the ends, was taken from the mother's abdomen. This was accomplished by making two parallel incisions 5 inches apart, extending from near the crest of one ilium to the other, and between the pubes and the umbilicus. The skin was carefully separated from the underlying fat and cellular tissues with a sharp knife, so that the under surface of the skin was bare and smooth. This piece of skin was applied about the boy's knee joint thus: Each end was split down about 4 inches, so as to make four tails, but leaving the center of the piece intact. The middle of this big transplant, about 5 inches wide, was placed so that it covered the popliteal space. Then the four tails made by splitting the ends were wrapped around the knee joint above and below the patella and the tails were lapped. Then the edges of the tails were fastened together with fine silk sutures with such tension that the transplant might hug the raw surface of the joint with just enough pressure to eliminate vacant spaces between the two raw surfaces, but without being so tight as to interfere with the blood supply. I used whole skin graft about the knee joint and popliteal space. This is essential where contractures are to be avoided and where in normal use of the limb constant movement takes place. The whole skin is less vulnerable and more pliable and is not so likely to crack or chafe. About the joints and over tendons it should always be used,

when possible. The remainder of the granulating surface over the leg, thigh, buttocks and groin we covered with half skin, or Thiersch graft, taken from the mother's thighs. We secured pieces about four to six inches long and an inch wide and, when possible, applied them by placing one end of the graft on the anterior surface of the leg and allowing it to fold around the leg and terminate on the posterior surface, repeating this on the other side. Thus the entire surface of the leg, thigh, buttocks and groin was covered. Care was taken to see that the two surfaces were free from intervening foreign material and that the new skin snugly hugged its new parent. No drugs or dressings for pressure, were applied direct to the new skin. A sheet was pinned about the cage. Except for the etherization the patient was none the worse for his venture. The mother's abdominal wound, from which the whole skin was taken, was accurately sutured. The half-depth denuded skin on the thighs was covered with vaseline gauze and stripped with zinc oxide adhesive plaster. The mother left the hospital in ten days all healed.

From October 13 when the grafts were placed, until November 17, one month and five days, the grafts apparently were doing well. On October 27, two weeks after the skin grafts were applied, inspection showed that all the grafts had taken except on the outer surface of the upper thigh, where the boy had got his fingers through the cage and scratched a place about two inches square, which remained denuded, and except for a place about the same size on the outer surface of the buttocks where the sheets came in contact with the grafts. At this point the cage was defective. Otherwise, it seemed that during the period from October 13th to November 17th the grafts were thoroughly established. During that time the patient was doing well in a general way, increasing in weight, with good appetite, sleeping well, and free from pain. There were dry crusts between the grafts and some exfoliation from the surface of the Wolfe grafts. There was some odor. The grafts had a pinkish color and were well anchored. There was little or no evidence of infection. For several days before November 17 it was observed that there was an increased amount of purulent-appearing fluid under the crusts between the grafts, and there was increased odor. Normal salt solution and Dakin's solution were sprayed over the surface for a day or so. With this unfavorable and nearly

seven months' old granulating surface, nothing like such a favorable result as was obtained to this date would ordinarily have been expected; and there is, it would appear, but one explanation for such a success, i.e., complete immobilization. There was no contraction of the leg; nothing had touched the grafts except at the two points mentioned; the new circulation had not been interrupted by movements either of the base or of the new skin. The failure of the graft at the two points only where there had been touching and disturbance, and its success at all other points, seems additional proof of the soundness of the principle of immobilization.

To clean the exfoliation referred to, I tried the application of small pieces of gauze wet in warm normal salt solution direct to the surface of the entire graft area, keeping the gauze moist by spraying with the same solution. At this time the patient had just a little elevation of temperature caused, presumably, by absorption of septic material from under the crusts. After two days these small pieces of moist gauze were removed, the boy crying some and complaining of pain at the time. This procedure helped to clear the surface of scabs and exudate; but it was not entirely successful and, therefore, in a few days, the same thing was repeated, with further improvement; but the crusts continued to form when exposed to the air. This application of moist gauze was repeated again on November 16 when, however, the patient's temperature increased rapidly to 103°F., and after this continued as a septic temperature. Locally the infection was increasing. The gauze was kept moist by spraying and was changed daily until the morning of November 21, but the patient's local and general condition was not improved. On November 17, in connection with the rise of temperature referred to, his appetite disappeared and there was a marked increase in the amount of discharge under and around the crusts.

On November 21, one month and eight days after the grafts were applied, a procedure was taken, one result of which teaches a most helpful lesson in respect to the process of skin grafting. The cast around the abdomen was cut and the whole immobilizing cage was temporarily removed and the boy was put into a warm tub bath. The small pieces of gauze came off the leg under the water without causing pain and we were able thereby to get

a cleaner surface. But when the boy was raised up to a perpendicular position for a few moments, to dry him after the bath, blood exuded from almost the entire surface of the leg. While the warm water had probably caused some hyperemia of the leg, there was no bleeding from the surface while the patient was lying in a horizontal position in the tub. It was not until he was put into a vertical position with the leg hanging down that the bleeding commenced; and the exuding blood stopped as soon as he was put back into his bed and the cast and cage replaced and elevated as it had been for weeks. This same procedure of putting on wet gauze for a day and then placing the patient in a warm bath was repeated on November 30 with the same result of severe bleeding from the leg when a perpendicular position was taken after the bath. Again, no bleeding occurred while in the bath horizontally; and, again, the bleeding suddenly ceased when he was returned to the horizontal position in his bed with the leg slightly elevated. When the bleeding took place the blood appeared to exude through the surface of the new skin; and small hemorrhagic blebs appeared beneath the new skin. After this the whole new skin was rapidly destroyed.

By December 8 the patient was pale, septic and very sick, his hemoglobin 35 per cent. He was given a light anesthetic and a blood transfusion, and the dead skin was removed. After this he improved. His temperature dropped, and on December 11, under an anesthetic, some autografts were applied to the upper part of the thigh and these have taken well and are growing. At this writing the patient is still in the Holy Cross Hospital with the autografts growing on the upper part of the thigh and buttocks, these areas being pretty well covered.

The ocular demonstration above described shows what can happen to the circulation and to new blood vessels on the surface of an extremity through changing the position from horizontal to vertical. After skin grafting, until we know that the new skin is a substantially fixed and permanent affair, and until three weeks, let us say, have passed, the burned part of the body should not be changed from horizontal to vertical position because, by doing this, the delicate capillaries of the



new blood supply may be destroyed by the rush of blood into them and may thereby change what would have been a successful skin graft into a failure. The sudden engorgement of the new blood supply by change of position, at least after a horizontal position has been maintained for some time, seems to destroy the circulation to the new skin and thereby cause death of the graft. On December 3 the boy was again put into a warm tub, but pains were taken, in view of the lesson suggested, not to allow the leg to hang down on removal from the bath; and on this occasion there was no bleeding whatever.

It is probable, however, that in this case there were other agencies that destroyed this new skin after it appeared so well established, and after more than six weeks had elapsed. First, there was infection, or some process producing similar symptoms, as was indicated by the increase in the boy's temperature, by his loss of appetite, by his increased illness, by the increased discharge about the crusts, and by the increased odor. This infection, plus the unfortunate circumstance of allowing the leg to hang down, with the consequent rush of blood under the new skin to dislodge it from its moorings, may, together, help to explain the destruction of the new skin. The main factor, however, was the isografts. John W. Sugden, of Salt Lake City, who has seen this case with me from the beginning almost daily, who gave the transfusions, assisted in putting on the grafts and cage and aided by suggestions and helped in many ways, suggested at once that this complete desquamation after the grafts had seemingly become well established was due to the use of homologous grafts. It is believed that when homologous grafts are used only about one out of ten are successful, and that if they do take, a longer time is required and that, in many instances, the grafts apparently take at first but later undergo a change. The theory is that homologous grafts act as a foreign protein and excite a reaction similar

to that of an anaphylaxis; that the grafts then undergo an aseptic necrosis and are either absorbed or separated; that contamination is present and the necrotic material and exuded serum supply culture media, true suppuration not being present.

Perthes<sup>1</sup> reported failures with isografts and success with autografts. Lexor<sup>2</sup> says, regarding isografts:

The error of observations depends mainly upon the fact that in isografts there is a rather firm adhesion of the graft until the third week, which simulates a 'take.' If the defects are not large there occurs under the dying desquamating isograft an epithelization of the wound surface from the wound edges. This new epidermis is easily mistaken for the work of the isograft.

Lexor did not grasp the true situation, viz., that the graft really did "take" but was melted away later by some form of intoxication. Schoene<sup>3</sup> says:

The primary toxic effect of tissue juices of the host upon the transplant cannot be denied. We know that the serum of a human under certain circumstances can hemolyze the red corpuscles of another. One cannot doubt but that through a similar process the success of a transplant can be frustrated . . . In addition to the injury to the transplant by the host we must recognize also an injury to the host by the transplant . . . A very important question also is in how far reactions of immunity and anaphylaxis are responsible for the failure of foreign transplants. That such reactions occur cannot be doubted.

Underwood<sup>4</sup> reports cases and says:

So far as I am aware there has been no effort to identify the reaction accompanying repeated skin grafting over large areas with that of anaphylaxis, yet it seems clear that they are closely related if not identical.

Holman,<sup>5</sup> in an instructive article

<sup>1</sup> Perthes, G. *Zentralbl. f. Chir.*, 1917, xlv, 426.

<sup>2</sup> Die Neue Deutsche Chirurgie.

<sup>3</sup> Schoene, Die Heteroplastische and Homoplastische Transplantation, 1912.

<sup>4</sup> Underwood, H. L. Anaphylaxis following skin-grafting for burns. *J. Am. M. Ass.*, 1914, lxiii, 775.

<sup>5</sup> Holman, E. Protein sensitizations in isografting. *Surg., Gynec. & Obst.*, 1924, xxxviii, 100.



reviews the literature, including the quotations from Perthes, Loxor, Schoene and Underwood above. He had microscopical sections of grafts made at different periods, and, regarding one case which he reports, says:

Certainly there occurred complete epithelization of the denuded leg by rapid spread of new tissue from the grafts transplanted from the mother. Microscopical sections of these grafts demonstrated conclusively that they

had "taken" and were living tissue at the time of their removal four months after their transference from the mother. That isografts will "take" is demonstrated without the slightest question, but that they may melt away subsequent to a successful "take" is also demonstrated. Our experiences with isografting, therefore, prompt us to recognize and stress a principle in isografting which has heretofore received scant attention and little emphasis, namely, the possibility of sensitizing the patient to the foreign proteins of the graft.



## STRAWBERRY GALL BLADDER

It is from recent investigations on this type of gall bladder that our present day conception of cholesterol and its relation to the gall bladder, and the origin of cholesterol stones, has arisen. Boyd's study of "strawberry" gall bladders has done much to clarify our knowledge regarding the origin of this type. His histological studies have demonstrated the location of cholesterol in the epithelial cells lining the gall bladder, together with its dissemination through the walls of the gall bladder. His further chemical and spectroscopic investigations have demonstrated the probability that the yellow strawberry-like spots in this type of gall bladder lesion represent a combination of a cholesterol ester with a fatty acid, and are true lipid deposits, correlating thus the disturbance in cholesterol metabolism with the gall bladder pathology, as seen in this lesion, commonly termed strawberry gall bladder. There seems little doubt that cholesterol stones are the result of a disturbance of cholesterol metabolism with a resulting increase of cholesterol in the bile, due perhaps to

the inability on the part of the gall bladder wall to permit the passage of cholesterol through it. It is interesting to note in the pathological sections that high grades of inflammation play but a minor part in this disturbance of cholesterol metabolism, and that the cholesterol deposits of the so-called "strawberry" type tend less and less to appear, as the inflammatory process in the gall bladder wall increases. The frequency with which polypoid masses of gall bladder mucosa laden with cholesterol deposits may be demonstrated in the wall of the so-called "strawberry" gall bladder leaves little doubt but that these masses separate from the wall of the gall bladder to float free within the viscus, and are the nuclei upon which are developed cholesterol stones in a gall bladder whose bile is over-rich in cholesterol crystals. This is the type of gall bladder which often shows nothing abnormal on inspection to the surgeon when the gall bladder is exposed, but which produces symptoms which are relievable by cholecystectomy.—FRANK H. LAHEY in *The Boston Med. & Surg. J.*



# TORSION OF THE SPERMATIC CORD\*

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**T**ORSION of the spermatic cord and torsion of the testicle are comparatively rare conditions, and are practically always surgical. Those cases that have not been treated surgically and have been followed up, have revealed eventually a completely atrophied testicle. C. Moncany<sup>1</sup> reported a case in a ten-months-old child in which he performed a detorsion without operation, and he reports atrophy and final disappearance of the testis. Perhaps many other cases which have been relieved by detorsion without operation would show a similar final result.

What was probably the first case was reported by Delasiauve<sup>2</sup> in 1840. Since then Vanvaerts<sup>3</sup> collected 44 cases, reporting them in 1904. O'Connor,<sup>4</sup> in 1919, collected 124 cases. More recently Keyes<sup>5</sup> and his associates at Bellevue Hospital reported seven cases from the records of the genitourinary service at that hospital. Clute<sup>6</sup> reported 3 personal cases in 1919. Max Thorek<sup>7</sup> reported 1 case in 1919, and 2 in 1925. Papin,<sup>8</sup> Murray,<sup>9</sup> Powell,<sup>10</sup> Begg,<sup>11</sup> Nash,<sup>12</sup> Young,<sup>13</sup> Meltzer<sup>14</sup> and others have reported cases, which indicates that the condition is more frequently recognized and recorded than formerly.

A white male, aged seventeen, was awakened out of a sound sleep by acute pain in the region of the left testicle which was followed in about a half hour with nausea and vomiting. The left testicle became markedly swollen and very painful to touch. The pain was very much exaggerated when the patient tried to stand. When examined one hour later, the history revealed the fact that the patient had taken unusually strenuous exercise by fencing, nine hours prior to onset of pain, but stated that he had experienced no pain at that time, and was entirely free from pain when he retired at 11.30 p.m. No history of sexual contact, venereal infection or trauma could be elicited.

Past history negative except for an attack of scarlet fever one year previously. Tonsils and adenoids removed ten years ago. Family history irrelevant. General physical examination essentially negative. The right testicle, penis, prostate, inguinal glands, and right inguinal canal revealed no abnormal enlargements, positions, discharges, or impulses. The left testicle was about twice the size of the right, was drawn firmly against the external ring, and was very tender. The lower left abdomen was slightly rigid and tender over the external ring and for a distance of about 3 cm. above the level of the ring.

A hypodermic injection of morphine was given and an attempt was made to manipulate the testicle. The patient was free from pain the following afternoon, and the testicle was found to be in its normal location and only slightly tender and practically normal in size. The patient was up and about and experienced no discomfort whatsoever. Two days later he had a return of the pain on arising, but with this attack there was no nausea or vomiting; the pain disappeared when the patient was recumbent, and recurred only when he tried to rise. Because the patient was comfortable when lying, a physician was not called until forty-eight hours later, when the patient was found to be lying comfortable in bed. The left testicle was swollen to about twice the normal size, extremely tender, and drawn up against the external ring as before.

Seen in consultation with Sturdivant Read, the diagnosis of torsion of the spermatic cord was confirmed, and the patient was referred to the Carson C. Peck Memorial Hospital where he was operated on by Dr. Read and me.

A low left inguinal incision 6 cm. in length was made, exposing the cord, which was found to be thickened and edematous, the tunica vaginalis being markedly thickened and dark in color. The testicle was found to be swollen, containing many areas of beginning gangrene. There was 180 degree torsion at the junction of the testicle and cord intravaginally. There was also a developmental defect in the mesor-

\* Read before the Brooklyn Surgical Society, October 7, 1926.

chium which apparently caused the testicle to lie in a partially twisted position normally. The epididymis was found to contain several dark gangrenous areas. The cord was then ligated near the external ring with interrupted suture-ligatures of No. 1 chromicized catgut, and cut between the ligatures. The testicle was thus removed. The wound was closed in layers, with one rubber tissue drain. The specimen was preserved for the Hoagland Museum.

The patient was discharged eight days after operation in good condition.

#### DIAGNOSIS

The differential diagnosis between torsion and strangulated hernia is very often most difficult, chiefly because torsion of the cord is not thought of at the time the condition occurs, as the diagnostic errors recorded in literature will bear out.

Briefly the differential points are: 1. The general symptoms of torsion are not so severe as those of strangulated hernia. 2. Vomiting is not so persistent and is never fecal, in torsion. 3. There is no evidence of flatus in the torsion tumor. 4. The bowels react to purgatives. 5. There is more shock in strangulation.

Vanvaerts has pointed out that if an epiploic strangulated hernia coexists with an ectopic testicle, differentiation from a torsion of the cord is impossible.

Acute epididymitis and traumatic condition can be differentiated by a careful history.

#### PROGNOSIS

In the recurrent types where the torsion is slight, a spontaneous detorsion may occur, but if the condition remains untreated, atrophy and gangrene may result. Sloughing of the tissues is very rare, although Putzu<sup>15</sup> in his experiments on dogs, report several instances where necrosis and sloughing occurred.

From the reported cases there is no indication that death occurs even without treatment.

#### TREATMENT

Orchidectomy and epididymectomy constitute the logical surgical procedure, when

the diagnosis has been established; for the patients upon whom detorsion has been practiced without operation, and those upon whom testicular fixation by suture has been done, eventually have had atrophied testicle.

#### CONCLUSIONS

1. This patient was of the age at which the condition is most frequent, as 75 per cent of the cases occur before the age of twenty.



FIG. 1.

2. The length of time elapsing between the history of the strenuous exercise and the onset of symptoms, nine hours in this case, is unusual.

3. The condition occurred on the left side in a patient whose testicle was well descended. Of the 124 cases collected by O'Connor, 70 were on the right side, and 54 on the left.

4. The torsion was intravaginal, which is the most frequent location.

5. Of the two recognized types of torsion of the cord, acute and recurrent, this case might possibly be classed as acute recurrent.

6. Orchidectomy and epididymectomy constitute the logical treatment, particularly in the recurrent type.

## REFERENCES

1. MONCANY, C. *Paris Chirurg.*, 1924, xvi, 132.
2. DELASIAUVIE. *Rec. méd. franç. et étrang., Par.*, 1840, 363.
3. VANVAERTS. *Ann. d. mal. d. org. génito-urin., Par.*, 1904, xxii, 401.
4. O'CONNOR. *Surge., Gynec. & Obst.*, 1919, xxix, 580.
5. KEYS. *J. Urol.*, 1923, ix, 510.
6. CLUTE. *Boston M. & S. J.*, 1919, clxxi, 231.
7. THOREK, MAX. *Interstate M. J.*, 1919, xxvi, 194.
8. PAPIN, J. *de méd. de Bordeaux*, 1919, xc, 429.
9. MURRAY. *J. Am. M. Ass.*, 1920, lxxc, 377.
10. POWELL. *Canad. M. Ass. J.*, 1921, x, 563.
11. BEGG. *Brit. M. J.*, 1921, ii, 843.
12. NASH. *Brit. M. J.*, 1921, i, 267.
13. YOUNG, H. *Practice of Urology*, 1926, ii, 164.
14. MEITZER, M. *J. Urol.*, 1926, xv, 601.
15. PUTZU. *Clin. chir., Milano*, 1912, xx, 1295.



## [SURGICAL SUGGESTIONS]

FOR the removal of non-malignant breast tumors the Warren incision, curved along the lower margin of the gland, is the least disfiguring approach. Through it much or all of the breast can be enucleated, if need be.

JUST as the chest should be roentgenographed for possible metastasis before operating on a bone sarcoma, so too, should chest, spine and pelvis be roentgenographed before operating on a breast carcinoma.

THE percentage of cures of breast cancer with axillary gland involvement is small. When the supraclavicular glands are involved curability appears to be nil; and in such a case operation would be justifiable only for psychic effect or to remove a breast that threatens offensive ulceration.

# A LIGATURE-CARRYING TONSILLAR HEMOSTAT

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THE occurrence of troublesome hemorrhage either during or after the tonsil operation constitutes a rather common complication.

Unfortunately, no patient upon whom tonsillectomy is to be performed can ever be regarded as being exempt from the possibility of hemorrhage, and it is plainly the duty of the operator, not only to control bleeding to the best of his ability at the time of operation, but to do all in his power to protect his subject from subsequent hemorrhages.

Formerly little or nothing was done to safeguard the patient against postoperative hemorrhage, the surgeon usually relying upon his ability to meet contingencies as they arose by such means as he could command. In this, pressure applied in the tonsillar fossa, the use of drugs to constrict the blood vessels and occasionally suturing the pillars over a pledget of gauze were methods perhaps most frequently used. Such methods of controlling hemorrhage seem insecure and on the whole insufficient when compared with the more logical one in use by many nose and throat surgeons today of ligating the bleeding vessels in the tonsillar fossa at the time of operation. By this statement, I would not be understood as decrying these older methods of controlling tonsillar hemorrhage, which in spite of ligation may still be useful in certain cases, but rather would suggest that such measures should, as it were, constitute a second line of defense, something for emergency use; and seldom if ever should they be relied upon as our chief means of control.

The ligation of tonsillar vessels, however, has been difficult and has usually required a rather high degree of skill on the part of the operator, as well as the

cooperation of a thoroughly trained assistant.

It seems not improbable that ligation of vessels in the tonsil operation will become a more nearly universal practice once the technique is simplified; and the ligature-carrying forceps presently to be described was designed with the intention of lessening in some measure the present difficulties.

The principle of operation of this instrument is not new. It embraces the idea of carrying a looped ligature over the point of a hemostatic forceps which clamps the bleeding vessel. When in position the loop is tightened, thus constricting the part, and as the tightening process continues the ligature is presently made to knot firmly about the vessel.

The advantages claimed for this new instrument are that it combines the hemostatic forceps and ligature carrier in one instrument, and with it the operator can ligate vessels without assistance other than that necessary to expose the field of operation.

The forceps differs in no respect from the curved tonsillar hemostats in common use. The ligature carrier is a movable rod slightly shorter than the forceps, which by means of outriggers attached to the forceps is held in position parallel to the latter. This rod has a small opening at the distal end through which the ligature is threaded, and at the outer end a groove to receive the long arm of the ligature to prevent entanglement.

The construction of the instrument is such as to permit this rod to slide in the direction of its long axis back and forth over the face of the forceps. When drawn back the carrier locks in position and in no way obscures the tip of the forceps from view. This is the position of the carrier

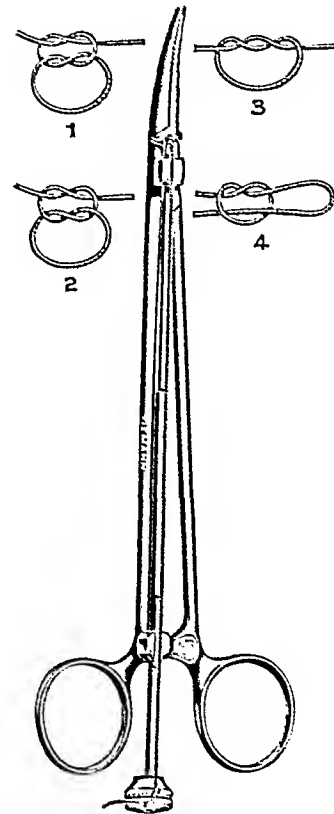
when the vessel is grasped, after which by pushing in on the outer end of the carrier, it is made to glide along until the eyelet passes the tip of the forceps by approximately three millimeters. This eyelet acts as a pulley through which the ligature travels, and is of just sufficient size to permit the ligature to run smoothly without undue friction.

To arm the instrument for ligation, use a ligature about fifteen inches long and tie a reef or square knot at one end forming a loop, as in knot No. 1, about one-half inch in diameter. This loop is passed over the tip of the forceps for a distance of one and one-half inches and the long arm of the ligature is threaded through the eyelet in the distal end of the carrier in the direction away from the forceps. The carrier is next drawn back and locked, sufficient traction is made on the long arm of the ligature to close down the loop until it embraces loosely the jaws of the forceps; and to prevent any possible entanglement the long arm of the ligature is placed in the slot at the outer end of the carrier (see illustration). So simple is the process that almost any operating-room nurse can be taught by a single demonstration to thread the instrument, and little more time is consumed in threading it than is required to thread a needle.

In using the square knot, there is one precaution which should be borne in mind, viz., the knot should be tied rather loose and never should be drawn absolutely tight. It is possible to tie the knot so tight (especially if the ligature is wet) as to cause it to jam in the eyelet. However, this is an accident which with any reasonable care need never occur. Instead of using the reef knot in forming the loop, the granny knot No. 2, the double knot No. 3, or the slip knot No. 4 may be substituted. None of these, however, possesses any advantage over the reef knot and none of them seems quite as dependable when tied about a vessel.

To tie, grasp the bleeding vessel in the point of the forceps, push in the carrier

as far as it will go, and while holding the carrier in this position, make traction on the long arm of the ligature, when the loop will slide down over the point of the forceps and engage about the vessel. Before the loop actually engages, the forceps should be drawn away sufficiently to put the tissues slightly on the stretch. Firm traction is now continued until the loop closes tightly. The ligature is then severed close to the point of the forceps, the carrier withdrawn and forceps released.



With this instrument, ligation of vessels in the throat can be done very rapidly and, as previously intimated, it places all the essential parts of the operation—grasping the vessels, holding the forceps, and tying the knot—in the immediate control of the operator. The need for a highly trained assistant is less imperative. There is one less instrument in the throat, which is an item of some importance, and especially so when operating with a local anesthetic. Furthermore, it is very simple of operation. After the vessel has been grasped, all one needs to do is to push

home the ligature carrier, make traction on the long arm of the ligature and it automatically ties. If the instrument is properly made and the ligature is wisely chosen, we may with all confidence expect that it will tie every time.

Any one possessing sufficient surgical skill to grasp the bleeding vessel can certainly tie it with this instrument, and with a moderate amount of experience he can grasp the vessel, tie and sever the ligature and remove the forceps easily, in from fifteen to twenty-five seconds.

The choice of ligature is important. In drawing it through the eyelet in the end of the carrier, the knot is slid along that

portion forming the loop and in that manner the loop is closed. For this reason the size of the ligature must always bear a proper relation to the size of the eyelet, otherwise the knot may jam.

A six-ply linen thread (unbleached) having a tensile strength of ten pounds has proved so eminently satisfactory as to seem to warrant unqualified recommendation.

One very quickly accustoms himself to the use of this instrument but the beginner may very well spend a few moments tying knots around bits of cotton in order to acquaint himself with its operation before attempting to ligate vessels in the throat.



## NEPHROLITHOTOMY

In cases of calculus the kidney, pelvis, and ureter are freely accessible for palpation, and the stone is usually quickly and easily found. Only when a single calculus lies freely in an aseptic pelvis do I remove it by pelveotomy. As a rule, I perform nephrolithotomy in the following manner: I hold the stone between the thumb and index finger of the left hand, while I make an incision in the capsule on the convexity of the kidney over the site of the stone with a small knife; then with a Lister forceps I work my way bluntly through the kidney tissue on to the stone, and while withdrawing the Lister forceps dilate the incision so that I can now introduce a suitable calculus forceps and extract the stone or

stones. My method has the great advantage over the ordinary one—splitting the kidney with a knife—that the urine canals and the blood-vessels are not cut through, but without any damage of note are bluntly separated from one another along the natural lines of cleavage of the tissues. In this way hemorrhage from the kidney parenchyma is avoided both during and after operation, which otherwise so frequently complicates nephrolithotomy in a dangerous manner, and this is best illustrated by the fact that three such excellent surgeons as Marion, Mayo, and Nicholich each has to do a secondary nephrectomy in 10 per cent. of his cases.—THORKILD ROVSING in *The Practitioner*.



TRANSACTIONS OF THE  
SECTION OF GENITO-URINARY  
SURGERY  
NEW YORK ACADEMY OF MEDICINE

*Meeting of March 16, 1927*

THE CHAIRMAN, DR. FREDERICK T. LAU, PRESIDING

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UNILATERAL RENAL APLASIA

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MONTREAL

THE condition which we wish to discuss is that of renal aplasia, or defective development of the kidney. It is one that is of interest from the point of view of embryology, and also, as an anatomical variation.

The functionless kidney is of general interest to the surgeon and internist, but it is of special interest to the urologist, and for this reason, we wish to present six cases which we have had in the urological service of the Royal Victoria Hospital.

These cases are all in the class of developmental defects; and we do not intend discussing such other causes of functionless kidney as tuberculosis, calculus or a closed pyonephrotic lesion.

Of the six cases, five are living, and we also had the opportunity to examine clinically the other case before death.

In the series there is a range from complete absence, in one case, to that of hypoplasia in two others. When we look at the embryology for a moment we can see that there is ample room for such variation in the rudimentary organ.

In complete absence there is evidently a lack of formation of the renal bud from the Wolffian duct. This condition of complete absence is reported by Anders to be present in about 1 case in 1800, and by Motzfeld as 1 case in 1000. Some 350 to 360

cases reported in the literature and from our series we can add one to the list.

Many of these cases show some abnormality in the genital tract and Moore states that "in 75 of the 226 cases examined, or 33 per cent, more or less extensive congenital defects of the genital organs are recorded."

In these cases in the male there is evidently a defect in the formation of the Wolffian duct itself, and in the female an associated defect in the Muellerian duct.

A defect at a later period in embryonic life would bring about the condition frequently seen in cases of absent kidney: that of normal genital formation with a normal bladder and ureteral orifices, but with a short rudimentary ureter, which may or may not be patent.

This condition is fairly frequent. Quoting Anders again, he states that "Out of the whole number of 286 cases reported, the ureter was completely absent in 240 cases. In 24 instances a more or less rudimentary ureter was in evidence without the slightest indication of the presence of renal structure." The defect in this latter instance would, no doubt, be due to lack of development of the nephrogenic tissue, the precursor of the secretory portion of the kidney, associated with a defective development of the ureter bud, and the failure



of division into primary and secondary tubules.

In some of these cases a mass of connective tissue has been found in the region where the kidney should normally lie, but no mention has been made of the findings of any evidence of renal tissue (Lewis, Gilmore).

It is reasonable to suppose that this defective development, whatever it may be due to, could occur at a slightly later period in embryonic life and leave some traces of fetal or partially developed renal tissue not forming in any way what could be called, anatomically, a kidney.

Three of our cases are of this type. A defect arising at a later period would leave a more perfectly formed kidney, which may or may not function. These are of the type classified as hypoplasia. Many such cases have been reported in the literature, and two in our series would fall in this class.

This defective development has been considered by Coplin to be due to defective arterial development, coinciding probably with the work of Bagg on congenital defects on roentgenographed mice. Bagg has given many instances of absent and rudimentary kidney following this method. In some cases the rudimentary kidney was no larger than the head of a pin, while in many it was completely absent.

Whatever may be the anatomical findings in each individual case, each one is non-functioning, and the diagnosis of such a condition is of extreme importance to the urologist, if, under the stress of carrying on all the excretory function, the sole kidney becomes damaged whether by nephritis, calculus or infection. Ballowitz stresses the frequency of calculus formation in the solitary kidney while the combined statistics of Ballowitz, Moore and Anders indicate that a greater than the normal percentage among subjects of congenital single kidney die of kidney complaints. Anders also found that in 42 per cent of the cases in his series, the single kidney showed advanced lesions of chronic nephritis.

Throughout this discussion we have used the term *aplasia* to mean incomplete development. This we believe would also include both the absent and the rudimentary kidney, the differentiation being only a matter of degree.

The cases which we have to report are as follows:

CASE 1 (59124). Mrs. P. L. aged nineteen years, was admitted to the hospital July 16, 1926, suffering in the right lumbar region from pain of four days duration. The attack had commenced with aching pain in the right lower quadrant of the abdomen, followed shortly by similar pain in the right lumbar region, and more acute attacks radiating down the right leg.

The following day the patient developed fever, chills and diurnal micturition every half hour—voiding small quantities with a marked burning sensation.

She gave a history of right-sided pain with fever and chills during her first pregnancy three years previously, but had no such symptoms during the second. She was admitted to the hospital on the day following the onset of her symptoms, and on examination appeared to be in great pain, with frequent rigors and a temperature of 103°.

There was marked tenderness in the right costolumbar angle, also over the whole right side of the abdomen. The right kidney was easily palpable, enlarged, firm and tender. The left kidney was not palpable nor tender. There was no abnormality of the external genitalia. The urine was cloudy, straw-colored, 1010 sp. gr.; acid; albumin +; sugar, none; microscopically: epithelial cells, motile bacilli, pus ++, but no red blood cells or casts.

1 c.c. of phenolsulphonphthalein, intramuscularly, gave: 10 per cent, first hour; 25 per cent second hour; total, 35 per cent.

On cystoscopy the bladder mucosa was found to be slightly inflamed. The right ureteral orifice was normal in position and appearance, but the left was not made out. The right ureter was catheterized to the renal pelvis, and a specimen was obtained which showed microscopically: epithelial cells; pus ++; few red blood cells and colon bacilli. Roentgenograms with catheter in the right ureter showed the tip of the catheter at the level of the third lumbar vertebra. No shadow was made out which would suggest calculus. A large right

kidney shadow was noted, with no evidence of any kidney shadow on the left side.

The condition remained unchanged, with a temperature ranging between  $104^{\circ}$  and  $105^{\circ}$ . The following day a decapsulation and nephrotomy was performed. It was noted then that the kidney was approximately double the size of a normal kidney. No abnormality of vessels was noted. The patient was discharged three weeks later with the wound healed and the renal function improved, as shown by the phenolsulphonphthalein test (1 c.c. intramuscularly), giving 40 per cent the first hour, and 30 per cent, the second—total, 70 per cent for two hours.

muscularly) gave: first hour, 50 per cent; second hour 20 per cent; total, 70 per cent for two hours. The blood findings were normal:

Blood urea	.420 gm. per liter.
Blood urea nitrogen	19.6 mgm. per 100 c.c.
Creatinine	1.29 mgm. per 100 c.c.

Cystoscopy at this time showed the bladder mucosa to be slightly inflamed and granular. The right ureteral orifice appeared normal. The left could not be found; in fact there seemed to be an absence of the trigonal ridge on that side. The right ureter was catheterized to the renal pelvis and clear amber urine was obtained, containing a few red and white blood cells.

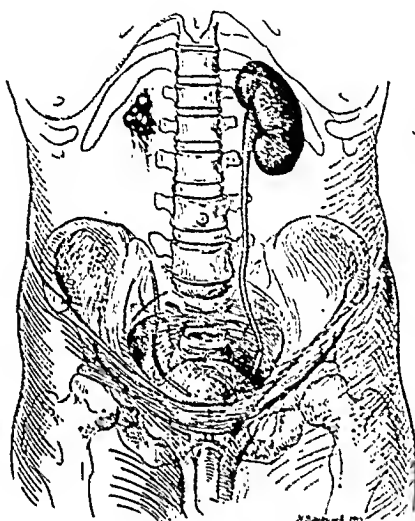


FIG. 1.

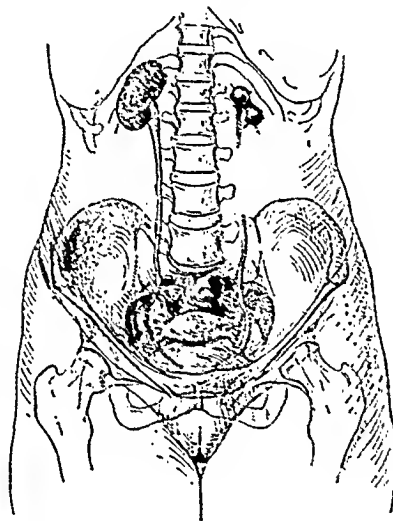


FIG. 2.

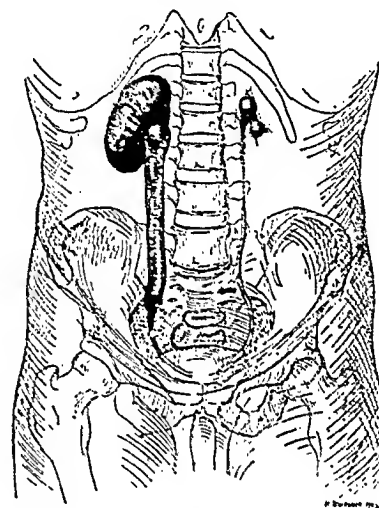


FIG. 3.

FIG. 1. Schematic drawing showing nodules of rudimentary renal tissue in right kidney region of Case II. Nodules connected by fibrous bands. Lower portion of ureter patent to sacroiliac synchondrosis. Upper portion not found at operation.

FIG. 2. Schematic drawing showing two cysts connected by fibrous bands in Case III. Lower portion of ureter patent, upper portion absent.

FIG. 3. Schematic drawing of Case IV showing nodules of aplastic kidney tissue in left renal region. Lower portion of ureter patent, the upper represented by a fibrous cord connected with these nodules. Stricture in lower portion of right ureter with hydroureter and hydronephrosis.

She was readmitted two months later still troubled with pain on the right side, some tenderness over the bladder, and a diurnal frequency of five to six times; nocturnal urination once, accompanied by burning sensation.

This time there was tenderness in the right costolumbar angle, and the right kidney was enlarged, firm and tender. There was slight tenderness along the course of the right ureter and over the bladder. The urine was clear; straw-colored; sp. gr. 1010; acid; a faint trace of albumin was present, but no sugar. Microscopically there were scattered pus cells and some epithelial cells. The renal function by the phenolsulphonphthalein test (1 c.c. intra-

Culture of this specimen gave no growth. A pyelogram with 4 c.c. of 12 per cent sodium iodide solution in the right pelvis showed a very large kidney shadow, with only a partly filled large renal pelvis. Indigo carmine injected intravenously appeared from the right side in two and a half minutes but none appeared from any portion of the left side of the bladder or urethra.

CASE. II. H. W., male, age thirty-one years admitted July 30, 1925 complaining of a urinary frequency from which he had suffered for two years. Four days previously he had an attack of colicky pain on the right side and

from that time on he had burning on urination. He gave no other history or symptoms. As a child he had had infantile paralysis, scarlet fever, mumps and chicken-pox. His general examination was negative apart from some atrophy of the left leg and paralysis of muscles below the knee. The blood pressure was 120/80.

Examination of the genitourinary system showed no costolumbar tenderness; the kidneys were not palpable; there was slight ureteral tenderness on the left side but none on the right. There was no suprapubic tenderness or distension. External genitalia and prostate were normal. Urine was clear, straw-colored, 1020 sp. gr., and some albumin was present, but no sugar. Microscopically there were present pus positive, motile bacilli, epithelium, and calcium oxalate crystals.

Renal function tested by phenolsulphonphthalein intramuscularly given, was apparently normal: the first hour, 55 per cent; the second hour, 15 per cent; total 70 per cent in two hours. Wassermann blood reaction negative. No tubercle bacilli were demonstrated in the bladder urine on several examinations.

Roentgenography of the kidney and bladder region showed a small round shadow opposite the fifth lumbar vertebra on the right side.

At cystoscopy the bladder mucosa was found to be slightly inflamed. The ureteral orifices, in normal position, appeared slightly gaping. The left ureter was catheterized to the renal pelvis and a specimen obtained. The right ureter could be catheterized for only half the distance and no specimen was obtained. That from the left showed an occasional red and white blood cell, and a few epithelial cells, and culture gave a growth of *Bacillus coli* with communis. Roentgenograms, catheters in position, showed the left catheter up in the renal pelvis but the right only at the sacroiliac synchondrosis. No shadows were seen suggestive of calculus or of the previously noted shadow. A secondary cystoscopy confirmed these findings, also indigo carmine injected intravenously appeared from the left side in five minutes but none from the right in fifteen minutes.

The diagnosis was made of a probable closed tuberculous lesion of the right kidney, and operation was performed on August 6, 1925. On exposing the right kidney only a small mass of fat and fibrous tissue was found, containing several small nodules of a firmer tissue. Attached to these were several small blood vessels. No ureter could be found. The mass of

tissue was removed from a small indefinite pedicle. There was no other evidence of kidney tissue.

Dr. Waugh of the Pathological Department reported: Specimen consists of a mass of reddish tissue, of rubbery consistence, about 30 gm. in weight. At one end is a cyst with a smooth pale wall. It is the size of a small walnut. Sections of the tissue show it to be made up of an irregular mass of loosely arranged fibrous connective tissue containing numerous larger and smaller blood vessels. There are occasional peculiar, duct-like structures, containing blue-staining, more or less homogeneous material, and lined by small irregular cells, having little resemblance to epithelium, probably atrophic, degenerated and necrotic undifferentiated lining. The cyst wall consists of wavy, fibrous, connective tissue, without epithelial lining. Hyaline fusion of the fibrous connective tissue is occasionally seen. There is no evidence of inflammatory changes in the tissue. Diagnosis: aplasia of kidney.

The patient developed bronchopneumonia about ten days after operation but soon recovered. When heard from six months later he was free from symptoms, had gained in weight and strength, and was able to go about his work as usual. He has had no recurrence of pain on the right side since his operation.

CASE III. Mrs. D. F., aged thirty-three years, was admitted to hospital complaining of severe pain in the left loin which had awakened her from sleep four days previously.

Diurnal frequency, five or six times; nocturnal frequency once, had appeared two days later. Slight burning accompanied urination. She gave the history of having had an attack of acute pyelitis on the right side, four years previously, and had suffered from a slight dragging pain on that side for the past six months. She had one child, ten years of age, alive and well.

On examination her general condition was normal. B.P. 120/70. Examination of the urinary system revealed no costolumbar tenderness. The kidneys were not palpable and there was no tenderness over the kidneys nor along the course of the ureters. There was no suprapubic distension or tenderness. The genitalia were normal, externally and by vaginal examination. The urinalysis showed urine of a hazy straw-color, sp. gr. 1028; acid; no albumin or sugar present. Epithelial cells, a few white blood cells and a few motile bacilli were present. No

FIG. 4.

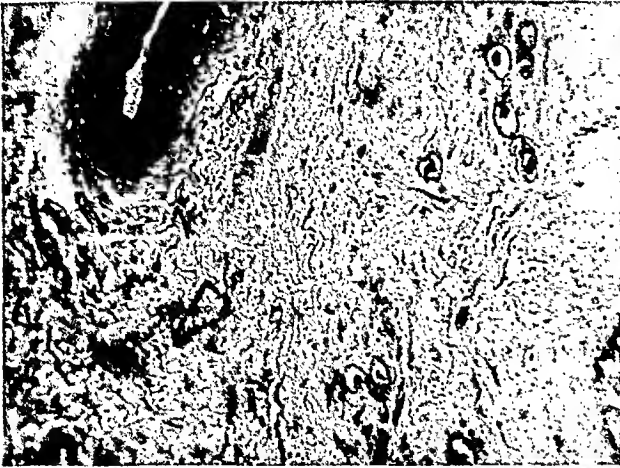


FIG. 5.

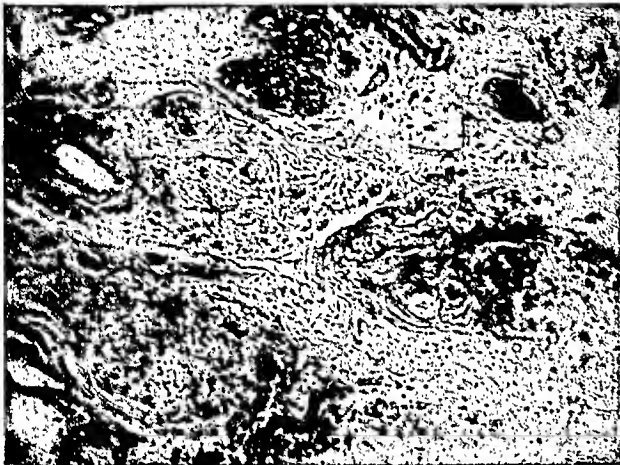


FIG. 6.

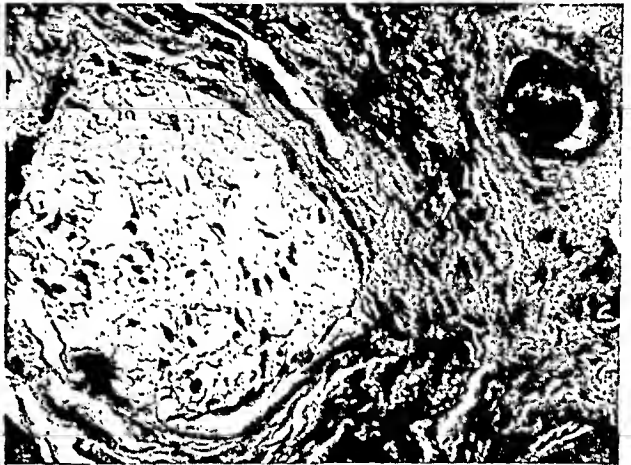


FIG. 7.

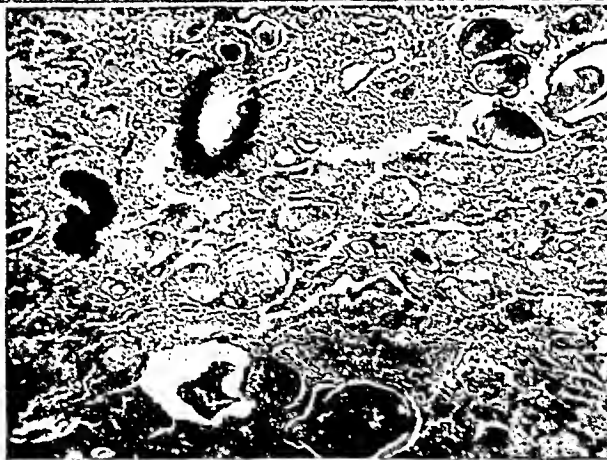


FIG. 8.

FIG. 4. Case 11. Rudimentary uriniferous tubules in a mass of connective tissue. The cells are flattened and several of the tubules contain casts. A thick-walled vessel is seen in the other portion of the section. No glomeruli are found in this specimen. (Low power.)

FIG. 5. Photomicrograph of section from cyst wall in Case 111. Connective tissue predominates, with here and there nests of partially and completely developed tubules and glomeruli. Several of the tubules contain casts. (Low power.)

FIG. 6. Section from nodule in Case 14 showing a matrix of connective tissue and several nests of rudimentary tubules with flattened epithelium. Several glomeruli are present, overgrown by fibrous tissue. (Low power.)

FIG. 7. Photomicrograph from aplastic kidney in Case v. Showing glomerulus and one tubule enclosed in connective tissue. Glomerulus has been invaded with connective tissue which has undergone hyaline degeneration. Lumina of tubule contains an albuminous cast. (High power.)

FIG. 8. Photomicrograph of section of tissue from aplastic kidney in Fig. 9, showing the hyaline remains of glomeruli, with a few dilated tubules containing casts. There is a generalized round cell infiltration of the connective tissue. (Low power.)

tubercle bacilli were found in the bladder urine. Roentgenograms of kidney and bladder region were negative for calculi.

One c.c. phenolsulphonphthalein intramuscularly gave 65 per cent in two hours. The blood Wassermann reaction was negative. The blood findings were normal:

Blood urea..... .288 gm. per liter  
 Blood urea nitrogen 13.4 mgm. per 100 c.c.  
 Creatinine..... .1.29 mgm. per 100 c.c.

At cystoscopy the bladder mucosa was normal. The ureteral orifices were normal in appearance, shape and position. The right ureter was catheterized to the renal pelvis and a specimen obtained. The left catheter was obstructed in the lower ureter and no specimen was secured. The right specimen showed cloudy straw-colored urine containing a few red and white blood cells and some epithelial cells. Roentgenograms with catheters in position showed the right catheter in the renal pelvis at the tip of the third lumbar vertebra. The left was at the sacroiliac synchondrosis, but no shadow of a calculus was seen.

A second cystoscopy confirmed these findings. A ureteropyelogram was attempted on the left side but no shadow of iodide fluid was seen. Indigo carmine injected intravenously appeared from the right side in four minutes but none appeared from the left in fifteen minutes.

The condition was thought to be an advanced left renal tuberculosis and operation was performed. On opening the left loin a small mass of tissue was seen in the kidney bed. This consisted of several rounded cyst-like bodies, one the size of a plum, the other much smaller. No ureter could be made out. The pedicle consisting of several small vessels, was ligated and the mass removed. The two cystic masses were connected by fibrous tissue bands. Incision of the cysts revealed a more or less viscid fluid, dark amber in color, about 15 c.c. from the larger and 5 c.c. from the smaller. This fluid showed upon examination approximately the same findings for urea, etc., as blood:

Urea..... .360 gm. per liter  
 Urea nitrogen..... .16.80 mgm. per 100 c.c.  
 Creatinine..... .1.59 mgm. per 100 c.c.  
 Sugar..... .093 per cent

Examination of tissue removed showed it to be irregular, dense and fibrous, with areas of hyaline fusion containing nests of poorly developed tubules, the lining epithelium of which was

swollen so that its differentiation was lost, the lumina filled with hyaline casts. Glomeruli were rare and the capillaries in Bowman's capsule disintegrating. Sections of the cyst wall showed it to consist of a thin capsule of fibrous connective tissue having an inner margin of flattened epithelial cells. Diagnosis: aplasia of kidney with multiple cyst formation of rudimentary tubules. The patient has much improved, gained 40 pounds in weight, and been free from symptoms since operation.



FIG. 9. Aplastic left kidney and hydroureter removed from Case VI, a boy nine years of age. Ureter enormously dilated and tortuous, with narrow stricture at junction with bladder. Kidney is a shell of connective tissue containing a few glomeruli and rudimentary tubules.

CASE IV. Mr. D. St. G., aged thirty years, was admitted on May 27, 1926, complaining of anuria of four days duration. He had been suffering from slight attacks of pain in both loins for the two previous years. These attacks were accompanied by some burning on urination. He had a slight attack of pain in the right loin, radiating down to the groin shortly before the onset of the anuria. History apart from this was negative.

On admission the patient appeared in evident distress though there was no vomiting or nausea and no edema of face, hands or feet, and mentally he was quite clear. The tongue was coated and dry. The eye grounds were normal. General examination was negative. B. P. 110/75.

Examination of the genitourinary system revealed no costolumbar tenderness. The kid-



neys were not palpable, though there was slight tenderness in the left loin in bimanual palpation of that side. No masses were palpable in the loins. There was no tenderness along the course of either ureter, and no suprapubic distension. The penis was normal in conformation. No discharge was present. The urethra easily admitted No. 16 soft rubber catheter but no urine was obtained from the bladder. The scrotum and contents were normal. Prostate, per rectum appeared normal to the examining finger. Roentgenograms of kidney and bladder region did not show any shadow which would suggest a calculus.

Blood findings at the time were:

Blood urea.....1.42 gm. per liter  
Blood urea nitrogen...66.36 mgm. per 100 c.c.

He was treated symptomatically, heat to the loins, electric baker and intravenous salines of 10 per cent glucose. The following day he had not voided and was cystoscoped. The bladder was empty but symmetrical, the mucosa normal. The ureteral orifices were normal in contour and position. The right ureter was catheterized for a distance of about 4 cm. when definite obstruction was met. The left ureter was catheterized for about 15 cm., when definite obstruction was met. No specimens of urine were obtained. Roentgenograms showed both catheters in the relative positions mentioned, but no shadows were seen suggestive of calculi. No clearly defined kidney shadows were seen. The cystoscopy was repeated the following day but with the same negative results.

On the morning of May 31, he had still not voided any urine, and it was seen that his condition was critical. He had become nauseated and was vomiting all fluids taken. He had become edematous and was also somewhat cyanosed and dyspneic. An operation was indicated as the last possible means of relief, as he had not voided for seven days.

His blood figures at this time had risen to:

Blood urea.....2.076 gm. per liter  
Blood urea nitrogen...97.08 mgm. per 100 c.c.

In view of the history of pain on both sides and the slight tenderness noted on the left side at examination, that side was opened first. On opening the left loin the tissues were markedly edematous, as were all the body tissues. No perirenal capsule was found, and no kidney. In the region where the kidney should be there was a small mass of fat and

fibrous tissue containing several rounded masses of firmer tissue. Several small vessels entered this, forming a pedicle. From this mass also a fibrous cord ran downwards toward the bladder. This mass of tissue was removed.

The right loin was then opened and a slightly larger than normal kidney found. The surface appeared slightly granular, and was a darker red than usually seen. The pelvis and ureter were markedly dilated, and the wall of the ureter, much thinned out. An opening was made at the ureteropelvic junction and a large quantity of clear, pale urine escaped. A bougie was then passed downwards, and met with obstruction in the pelvic portion of the ureter. This was overcome and a No. 12 bougie was passed to the bladder. A tube was then inserted in the opening in the pelvis for drainage.

His condition improved immediately upon the establishment of drainage. He drained a large quantity of urine from the loin for two weeks, when, after dilating the right ureter to No. 9 F. the patient voided and several days later the wound became dry. The urine passed was pale and of a low specific gravity: 1008–1010. There was some slight infection with colon bacilli, following the operation. The small specimen removed from the left side was examined by Dr. T. R. Waugh of the Pathological Laboratory; his report is as follows:

Specimen consists of some fat tissue in which are a few filbert sized masses of firmer tissue. Section shows irregular masses of fat cells connected by a loose fibrous stroma. In some areas are irregular tubular spaces lined by a regular layer of cuboidal epithelial cells. These large pale cells appear of the embryonic type, and the arrangement resembles the anlage of convoluted renal tubules. There are also tufts of cells resembling glomeruli containing red blood cells. There is a dense fibrous tissue stroma surrounding these structures and numerous thick walled vessels are seen. There is no related definite kidney parenchyma, although metanephritic blastoma with tubular and glomerular formations are found. Diagnosis: aplastic kidney. Congenital malformation of metanephros.

The patient when seen in October, 1926, had gained in weight and strength. He was free from symptoms but his urine was still of low specific gravity and there were scattered pus cells and colon bacilli in the urine.

Blood urea..... 175 gm. per liter  
Blood urea nitrogen... 35.3 mgm. per 100 c.c.

When seen again in January 1927, his urine still contained scattered pus and was of low specific gravity. Phenolsulphonphthalein tested 20 per cent for 2 hours.

Blood urea..... .660 gm. per liter  
Blood urea nitrogen... 30.8 mgm. per 100 c.c.

The right ureter easily admitted a No. 6 catheter, and there was no hydronephrosis.

CASE V. Mrs. E. M., aged forty years, was admitted first in 1914, suffering from incontinence of urine following a birth trauma, which had occurred in 1913. She had complete incontinence of urine. Her general examination was negative, the blood pressure was 146/88.

Cystoscopy showed a small bladder containing about one ounce of thick creamy pus. The mucosa was inflamed. There was a large opening towards the right side on the floor, communicating with the vagina. The left ureteral orifice was normal. This was catheterized and normal urine obtained. No right ureteral orifice could be demonstrated, and indigo carmine injected intravenously appeared from the left ureter but not from the right side, nor from any portion of the right side of the bladder. A plastic operation was performed. This was successful for some months, but incontinence reappeared.

It was found on the next admission that a small fistula from the bladder communicated with the cervix and a hysterectomy was performed. Examination of urine from the left kidney showed at this time some evidence of infection. She was admitted in 1920, suffering from fever, chills and pain on the left side and also incontinence of urine. A small vesicovaginal fistula was present. Cystoscopy and catheterization of the left ureter showed an infected hydronephrosis. Roentgenography with the catheter in place showed a marked kink in the lower left ureter, with the catheter coiled downwards towards the iliac crest. Evidently a stricture which had resulted from trauma at the time of the hysterectomy.

She was again admitted in 1923 in uremia, and died shortly after admission.

Examination showed a large distended pyonephrotic sac on the left side, with the lower portion of the ureter narrowed and bound down in a mass of scar tissue. Examination of the right kidney showed a small mass of kidney tissue about the size of an almond, covered with a thick fibrous capsule. The pelvis was small but the ureter appeared about the normal

size. About 3 or 4 cm. from the bladder it was completely stenosed and became lost in a mass of scar tissue about the bladder. Microscopically the kidney appeared to be made up of a mass of fibrous tissue with a few small blood vessels showing hyaline degeneration of their walls. An occasional tubule with flattened epithelial lining, and a few glomeruli, which had undergone invasion by fibrous tissue, were seen scattered throughout the fibrous tissue of which this was mainly composed.

CASE VI. L. M., a boy of nine years, was admitted May 5, 1924, complaining of frequency by day, of five to six times and cloudy urine; which had been noted by parents for the past three years. He had also suffered from enuresis since childhood.

On examination he appeared to be well developed and nothing abnormal was noted. B.P. 108/65. The genitourinary system on examination showed no costolumbar tenderness, the kidneys were not palpable. There was no ureteral tenderness nor tenderness or distension of the bladder. His urine was cloudy amber, 1020, sp. gr., acid, albumen positive, no sugar. Microscopically it showed pus +, a few red blood cells and a few cocci. No tubercle bacilli were found in the bladder urine. The phenolphthalein test, 1 c.c. given intramurally, showed 30 per cent the first hour and 22 per cent the second, total 52 per cent.

Roentgenography of the kidney and the bladder region did not show any shadow suggestive of calculus. Cystoscopy showed a rather tight anterior urethra, No. 18 F cystoscope used. The bladder was symmetrical, the mucosa was slightly inflamed. The right ureteral orifice was normal. The left ureteral orifice was scarred and gaping and the left ureter could not be catheterized. Normal urine was obtained from the right side.

From the age of the boy, the frequency and the condition of the ureteral orifice a diagnosis of probable tuberculous kidney was made and operation performed. At operation the left kidney was found to be small, scarred with a slightly distended renal pelvis and a markedly dilated and tortuous ureter filled with purulent material and adherent to the surrounding tissues. The kidney and ureter were removed with difficulty. The kidney was a thinned out fibrous sac surmounting the dilated pelvis and ureter. Microscopically it showed a thin wall made up of fibrous connective tissue, a few small blood

vessels and the hyaline remains of many glomeruli. A few tubules were also noted.

The patient made an uneventful recovery. He has since gained in weight and, apart from one attack of hematuria 6 months later from the ulceration about the left ureteral orifice, has been free from symptoms.

An analysis of these six cases might prove of interest. As to sex, the numbers are equal, there being three of each. The ages are, nine, nineteen, thirty, thirty-one, thirty-three and forty years.

The left kidney was involved in 4 out of the 6 cases, and the right in 2 cases. This agrees with the majority of cases reported. Out of a short series of 18 cases collected by Goldstein, the left side was involved in 13, and the right in 5 cases.

The symptoms which compelled these patients to seek advice were usually on the side of the remaining kidney, although three of these had definite pain on the side of the aplastic kidney, and in Case II, the pain was confined solely to that side. The frequency, burning and pyuria were in all but one case, due to infection of the solitary kidney. In Case VI, the symptoms were evidently due to the infection of the large distended ureter on the side of the aplasia. In Case I, the solitary kidney was the seat of an acute pyelonephritis, and there was a history of an attack of pyelitis three years previously during pregnancy. The kidney in the case was about twice normal size, as shown by roentgenograph and operation.

In Case II, the remaining kidney was the seat of a low grade chronic pyelitis, as shown by a few white cells at cystoscopy, and a positive culture of *Bacillus coli communis*. No enlargement of this kidneys was made out by roentgenograms. In Case III, the patient had suffered from attacks of pyelitis on several occasions. The kidney shadow was not shown by roentgenograms to be enlarged.

In Case IV, there was a period of anuria of seven days, and at operation a slightly enlarged right kidney with a dilated pelvis and ureter were found. There was a stric-

ture of the ureter present in its lower third. A similar case was reported by Eisendrath several years ago.

In Case V, the renal aplasia was considered during the examination for the relief of vesicovaginal fistula, and verified at autopsy. The remaining kidney was the seat of infection, and following the trauma to the ureter and the resulting stricture, a large pyonephrosis developed.

In Case VI, the remaining kidney appeared normal in size and function.

There were no associated genital abnormalities in any of these cases.

The bladder was symmetrical in 5 cases. Case I showed an absence of the left ureteral orifice and the left half of the trigonal ridge. The bladder was inflamed in 5 of the 6 cases, which could be explained by the acute infection above. The right ureteral orifice was not seen in Case V. Whether this was damaged at the time the vesicovaginal fistula was incurred is a question. A stricture of the lower ureter was present in that case, and the terminal inch or so was lost in a mass of scar tissue. The ureteral orifices in the remaining cases, were in the normal situation. In Case VI, the left orifice was scarred and gaping, evidently a lesion of inflammatory nature. The ureter in these cases on the side of the aplasia varied. In Case I, there was no evidence of ureteral orifice in any region of the bladder, urethra or vagina.

It is reasonable to suppose that the ureter and kidney are completely absent, though Lyons reports a case in which a short rudimentary ureter was attached to the bladder in the normal position, though there was no ureteral orifice present. In Cases II, III and IV, there was a short rudimentary ureter present, patent for some distance. In two cases it ended blindly, but in the third it was continued as a fibrous cord attached to the aplastic kidney tissue, found in that region. In Cases V and VI there was a ureter present throughout, dilated, thickened and filled with purulent material, each strictured in its lower portion.



A small renal pelvis was found in these last two cases, with thickened fibrous walls. No pelvis was found in Cases II, III or IV.

Evidences of renal tissue on the side of the aplasia were found in 5 cases. There is no reason to expect any evident traces of renal tissue in Case I, many such similar cases have been reported in the literature, such as those reported by Goldstein, Bugbee and Lossee, Eisendrath and others.

In each of Cases II, III and IV, there was found a small mass of fat and connective tissue, containing nodules of firmer tissue, and in two, small thin-walled cysts. These nodules and cysts were connected by bands of fibrous tissue. They were supplied by one or more small blood vessels, and in one the fibrous cord passed downwards to become attached to the lower and patent portion of the ureter. Section of the nodules of tissue showed a predominating connective-tissue matrix, containing nests of cells, epithelioid in character, and in many instances forming ducts, the lumina of some containing albuminous material resembling casts.

In other portions rudimentary glomeruli could be made out. These were as a rule very few, and many were replaced by fibrous connective tissue, which in places showed hyaline degeneration.

The cyst wall was lined by flattened epithelium and made up of connective tissue fibers. The contents of the cyst in Case III showed it to contain urea, creatinine and sugar in the proportion similar to that found in blood.

In Cases V and VI, there was found a definite pelvis with a shell of tissue surrounding it, composed of connective tissue, tubules, and a few glomeruli, many of which had been replaced by fibrous tissue. Whether these two cases are aplastic in origin or whether they are the result of secondary atrophy is a question not easy to answer. A case similar to Case VI has been reported by Krotoszyner.

The differentiation between renal aplasia and secondary atrophy is difficult to decide

histologically. Kaufmann's Pathology states "there is no essential difference in the histological picture."

Oertel is of the opinion that in a secondary atrophied kidney, there is usually some evidence of a ureter and a pelvis being present.

In all probability Cases V and VI could fall into this atrophic class; but whether the atrophic process commenced in a kidney which was normal or hypoplastic in nature is impossible to say.

Hinman's work as well as that of Barney and of Scott tend to show that ligation of the ureter causes a hydronephrosis, rather than an atrophy, so that one is reasonable in assuming that these two latter cases are congenital in origin.

*Conclusions* to be drawn from this series, are that:

1. Unilateral renal aplasia is not uncommonly seen in urological practice.
2. The lesion appears to be more common on the left side.
3. There is usually a lesion of the opposite or remaining kidney.
4. There is sometimes unexplained pain on the side of the aplasia.
5. The operation and removal of the rudimentary kidney, relieved pain in two of these cases, for some unexplained reason.
6. In some case nodules or cysts containing renal tissue are found, without pelvis or ureter formation.
7. The aplastic kidneys in this series were all functionless.

#### BIBLIOGRAPHY

- ANDERS, J. M. Congenital single kidney, with report of a case; the practical significance of the condition, with statistics. *Am. J. M. Sc.*, 1910, cxxxix, 313-327.
- BAGG, H. J. Hereditary abnormalities of viscera, morphological study with special reference to abnormalities in kidneys of descendants of X-rayed mice. *Am. J. Anat.*, 1925, xxxvi, 275-311.
- BALLOWITZ. Cited by Moore.
- BARNEY, J. D. The effects of ureteral ligation, experimental and clinical. *Surg. Gynec. & Obst.*, 1912, xv, 290.
- BRAASCH, W. M. Renal anomalies, *Am. Assoc. of G. U. Surg.*, viii, 113.
- BUGBEE, H. G. and LOSEE, J. R. The clinical significance of congenital anomalies of the kidney and ureter: with notes on the embryology and foetal develop-

- ment of the kidney. *Surg. Gynec. & Obst.*, 1919, xxviii, 97-116.
- COPLIN, W. M. L. Unilateral renal hypoplasia and dysplasia due to defective arteriogenesis; relation to so-called hypogenetic nephritis. *Am. J. M. Sc.*, 1917, cliii, 381.
- DORLAND, W. A. N. A consideration of renal anomalies; with the presentation of two unique cases. *Surg. Gynec. & Obst.*, 1911, xiii, 303-319.
- EISENDRATH, D. N. Congenital solitary kidney. *Ann. Surg.*, 1924, lxxix, 206-288.
- GILMORE, E. R. Congenital absence of one kidney. *Brit. M. J.*, 1924, i, 784.
- GOLDSTEIN, A. E. Congenital absence of one kidney. Review of literature and review of two cases. *South. M. J.*, 1925, xviii, 750-757.
- HINMAN, F., and MORISON, D. M. Experimental hydronephrosis; arterial changes in progressive hydronephrosis of rabbits with complete ureteral obstruction. *Surg. Gynec. & Obst.*, 1926, xlii, 209.
- KAUFMANN'S Pathology.
- KROTOSZYNER, M. Observations on anomalies of the urinary tract. *Ann. Surg.*, 1917, lxxv, 560-572.
- LEWIS, D. N. C. Kidney malformations in the mentally disordered. *Am. J. Psychiat.*, July, 1923, iii, 64.
- LYON, M. W., Jr. Hereditary case of congenital absence of one kidney. *Anat. Record*, xiii.
- MOORE, J. Unilateral renal aplasia. *J. Anat. & Physiol.*, xxxiii, 400.
- MOTZFELD. Cited by Dorland.
- OERTEL. Personal communication.
- SCOTT, G. D. Experimental hydronephrosis. Produced by complete and incomplete ligation of the ureter. *Surg. Gynec. & Obst.*, 1912, xv, 296-309.

### Discussion

DR. E. L. KEYES: The paper is extraordinarily illuminating to me, for it covers ground that my previous experience has not included. The writers speak of relieving pain from these aplastic kidneys but give no theories as to what caused the pain or how it was relieved. The report encourages us to operate on such kidneys, when without the information from this contribution we would feel hesitation in supposing we could do any good for them.

DR. PAUL KLEMPERER (by invitation): I brought a few specimens illustrating the subject of the paper. One specimen is from a male baby that died two days after birth. Aside from the malformation of the kidney there was an anomaly of the esophagus which was the immediate cause of death. In this case there is complete aplasia of the right kidney. The suprarenal glands are perfectly normal on both sides. The left kidney is normal. On the right side there is no kidney and no renal artery. Within the bladder are seen two ureteral openings, in the midline, one opens into the normal ureter, and the other into a short blind pouch.

The other specimen comes from a female baby of three weeks, born at full term. The right ureter is narrower than the left, but opens into the bladder. In place of the right kidney there is a body smaller than the left kidney composed of cysts and renal tissue. It is a hypoplastic polycystic kidney. Histologically, the remaining part of the renal tissue shows glomeruli and collecting tubules surrounded by a mantle of connective tissue. A satisfactory explanation of this case is difficult.

The third specimen, which may be of particular interest for the surgeon, is a true hypoplastic kidney from a young woman of twenty-six years. The left kidney weighs only 40 gm., the right 120 gm. The left kidney shows only three pyramids whereas the other shows six. The last case illustrates the differences occasionally arising in the aplastic and hypoplastic kidneys. The diagnosis was tuberculous aplastic kidney. I have some doubt of the diagnosis because we found a perfectly normal large renal artery on this side; therefore, I would rather consider it as an atrophy of the kidney.

I would like to touch in a few words on the mechanism and development of the hypoplasia. Any attempt to explain the abnormality of the kidney hypoplasia or aplasia has to be based on the modern explanation of renal development. The kidney, as you know, develops from two different portions, the ureter bud and the nephroblastema; only after the proper union of these two portions is the definite kidney formed. If the union does not occur no kidney is formed and there is an aplasia of the kidney. It is plausible that during the embryonal development an interference in the union may occur at various periods of intrauterine life and that may explain the various gradations from complete aplasia to mere hypoplasia. In the first specimen there was only a ureteral pouch but no ureter was found. In other cases the lower ureter may be formed which passes higher up into a thin cord in the region of the kidney. In other observations we find the ureter growing up to the level of the kidney but instead of a kidney a body in appearance like a date or a bean is found which histologically presents an undeveloped kidney. I would have some doubt of the diagnosis of renal hypoplasia in a case in which normal glomeruli are found because when they are formed a complete union must have been established.

Now the lack of the normal developmental union of the nephroblastema and ureteral bud allows us to explain the aplasia and hypoplasia; but we have no explanation as to why this union does not occur. Certain cases of aplasia are interesting in that they form a distinct group among the greater number of aplasias: in these cases the more or less developed ureter opens into the vas deferens or into the seminal vesicle. I have a picture taken from a case observed and published in Marchand's laboratory: the ureter opens into the seminal vesicle; the kidney is absent. Another picture shows a case I observed when I was assistant in Sternberg's laboratory and which was described by Engel. It is of interest because on the strength of this case Engel attempted to give an explanation as to the reason of lack for union. One sees in the region of the right trigonum a cystic vesicle which collapsed when the bladder was opened. The sac when reconstructed was the size of a cherry and was filled with a peculiar slimy material. The ureter opens into the vas deferens on its medial side. There is no seminal vesicle in this case. The ureteral bud originates on the medial side of the primary excretory duct, and during further development the ureter wanders to the lateral side. Now Engel thought that the ureter remained on the medial side in this case and, therefore, growing upwards could not reach the site of the nephroblastema; therefore, no definite kidney was formed.

Another attempt at explanation was later made by Zimmerman, for the cases in which the ureter opens into the seminal vesicle. The seminal vesicle develops much later in embryonal life than the ureter bud appears. In fact, it is formed at the period at which the lower portion of the primary excretory duct has already become separated from the ureteral ostium into the bladder. In cases of union between ureter and seminal vesicle Zimmerman believes that the ureter originated from the primary excretory duct at an abnormally high level. It is plausible that in such an event the ureter will reach a higher segment than under normal conditions. We know, however, that the mesoblastic tissue of the thirty-first segment mainly has the potency of developing renal tissue and the thirtieth and twenty-ninth segments are of less or no capacity. Therefore, it is plausible that a union of the ureter bud with mesoderm of a higher segment will not develop a normal kidney. The nearer to the thirty-first segment the union occurs, the more renal tissue

will be formed. That may account for the various degrees of hypoplasia encountered in various observations. Lately, the theory has been advanced that there might be an embryonal hypoplasia of the nephroblastema to account for certain cases of renal aplasia or hypoplasia. The older hypothesis of fetal nephritis or absence of the renal artery as cause of these anomalies does not hold any more.

I think particular interest attaches to those cases of hypoplasia where the kidney is normal in shape and development but small. They constitute actual dangers because, as Dr. Aschner has told me, a kidney might give a normal functional test but be unable to compensate for the other kidney if it is removed.

These cases of aplasia and hypoplasia of the kidney have stimulated embryology.

DR. A. HYMAN: We are fortunate in having presented to us this most interesting and important contribution. In the whole realm of kidney surgery there is nothing more disappointing to the surgeon than to operate on a diseased kidney and lose the patient, and then discover that it was due to an aplastic condition of the opposite kidney. As has been pointed out already, there are many different forms and degrees of aplasia, from the solitary kidney to the hypoplastic kidney that functions. In the last few years we have come across eight cases of solitary kidney. In none of these cases however, was the other side explored, so we cannot be certain that there were not in some cases small buds or small bodies of kidney tissue. It is not easy to decide if a patient has a solitary kidney. In 6 of these 8 cases of solitary kidney, there were definite pathological lesions. Solitary kidneys are very prone to disease. The point comes up of hypoplastic kidneys that function. The type of hypoplastic kidney that functions fairly well, as determined by indigo carmine, is difficult to diagnose. How do we determine whether or not such a hypoplastic kidney exists?

There are three examinations that may be of value. One is the difference between the roentgenographic kidney shadows of the two sides. If the diseased side shows a normal-sized outline, and the other side a very much smaller shadow, we should suspect a hypoplastic kidney. Another test is the pyelogram. These kidneys have very small pelvises and very small calyces. The next test is the phenolsulphonphthalein output. I have investigated some of these cases and have found that there has been

a considerable quantitative diminution of phenolsulphonphthalcin, although the time appearance may be normal. Last year I lost a patient because it was not recognized at the time that he had a hypoplastic kidney. He had had a calculus removed from the right kidney a number of years before. He returned to the hospital last year with a very large right kidney full of stones. The opposite kidney shadow was smaller than normal, but the function of this kidney was apparently normal. The kidney with the stone showed no function with indigo carmine. My intention was to do a nephrectomy, but the kidney was so markedly adherent that I thought it more advisable to remove all the stones and drain the organ. Following the operation the patient drained profusely from the kidney, 17 ounces the first day, 20 the second, and 30 ounces the third day. The left kidney never functioned after the operation. The patient was cystoscoped and catheterized, but not a drop of urine was obtained from the kidney. He became uremic, and on the fifth day, despite the fact that the right kidney was draining, he died. Autopsy showed a hypoplastic kidney on the left side.

DR. H. S. JECK: Several of the preceding papers have emphasized the fact that we should be as certain as possible that we are not dealing with a hypoplastic kidney on one side when our attention is focused on the obviously diseased kidney on the opposite side. That is, we should be sure that the function of the supposedly normal kidney is sufficiently good to maintain life. At Bellevue Hospital, during the past few years, we happen to have recognized in two instances such atrophic kidneys by means of Geraghty's formula. In an article<sup>1</sup> Geraghty sets forth that in an atrophic kidney the percentage of urea is likely to be normal, and the appearance time of phenolsulphonphthalcin is often unchanged, but the total amount of phenolsulphonphthalcin and the total amount of urine excreted will be diminished.

To those of us who are not in the habit of making simultaneous bilateral pyelograms, this formula should be of value, as of course the making of a pyelogram is the only reasonably certain method of detecting the atrophic kidney.

DR. CLARENCE G. BANDLER: I would like to take this opportunity to present a specimen

<sup>1</sup>Geraghty, J. T., and Plaggemeyer, H. W. The practical importance of infantile kidney in renal diagnosis. *J. Am. M. Ass.*, 1913, xli, 2224.

which is somewhat in line with the presentation of Drs. MacKenzie and Hawthorne, but not an aplastic kidney. Before doing so, I wish to recount a case that I saw three or four years ago. I was called in consultation to see a patient who ten days previously had been nephrectomized for tuberculosis. Since operation she had passed no urine whatsoever and it was definitely established that she was anuric. She died soon and post-mortem examination revealed only a renal bud at the site of the supposedly remaining kidney. From this bud there extended downward for about three inches a fibrous cord which continued as a definitely formed ureter into the bladder. I had been informed that it had been impossible to cystoscope this patient prior to operation and that the diagnosis had been made from clinical symptoms, urinary findings and roentgenography.

The specimen I show is that of an anaplastic kidney. Eight days ago I removed this kidney from a child ten years of age, and I would say that it is the smallest kidney that I have ever encountered surgically. It is fairly well formed, is full of stones, and shows a chronic pyelonephritis. The patient had had symptoms for eight years and on two occasions, six years ago, had passed small calculi. My first impression from the size of the kidney was that it was embryonic, but the pathologic report reveals that it is fully formed, but shrunken, with thick-walled and dilated calyces and pelvis. Microscopic section shows a markedly sclerosed kidney in which destructive changes are of highest grade in the medulla, although very little recognizable cortical tissue is found. The pelvis mucosa is almost completely denuded of epithelium and is infiltrated with lymphoid cells. The kidney was functionless and the roentgen-ray pictures showed a large calculous accumulation with very little surrounding renal tissue.

DR. PAUL W. ASCHNER: Dr. Hawthorne pointed out that in two of his cases there was a question as to whether he was dealing with a congenital aplasia or a secondary atrophy due to an obstructive lesion in the nature of a stenosis. Three or four years ago I presented before this Section a case of interest in this connection,—that of a young girl with an obstruction in the upper ureter which could not be passed at first but subsequently was passed. On pyelography the pelvis was found small and it showed only two calyces. The upper ureter for a distance of about 3 cm. presented a very thin

thread of fluid and then appeared normal down to the bladder. It was thought we were possibly dealing with an extrarenal tumor and exploration was done. At operation we found a very thin thread-like ureter, for about 2 inches below the kidney. I believe this was an aplastic condition of the upper ureter.

DR. J. S. READ: It is a valuable clinical point to be told that the removal of these small masses of aplastic renal tissue is sometimes followed by complete clinical cure of the pain and systemic infection. Heretofore when no definite kidney mass has been found, we have refrained from doing anything. Now, thanks to this splendid piece of work, I shall know enough to remove the small pieces of indefinite tissue in the hope of producing a cure.

DR. D. W. MACKENZIE (closing): I wish to thank our confrères for their reception of this paper, the topic of which came to us when looking over the different types of cases on the service in the last ten years.

There are many cases of kidney aplasia in the literature but the clinical aspect has received very little attention. We felt the reported cases in this paper to be of some interest clinically, especially the symptomatology.

A few years ago before this Section we showed interesting anomalies of the kidneys, one with a double ureter on one side and also a small perfectly formed aplastic kidney on the other. Since then we have had another case, that of a child of three weeks, that had been killed by a fall from a fire escape. One kidney was normal, the other had an occluded strictured ureter with hypoplasia of kidney.

The secreting hypoplastic kidney is, I think, of even more importance to us in our diagnostic work. The main lesson is the necessity of examining both kidneys, especially if contemplating radical surgery on one.

## PRESENTATION of INSTRUMENTS

### A NEW SUPRAPUBIC SUCTION TUBE

J. SYDNEY RITTER, M.D.

Through the courtesy of Dr. Joseph F. McCarthy and under his supervision, I have been privileged for the past year and a half, at the New York Post-Graduate Hospital, to study suprapubic suction drainage.

At the American Urological Association meeting in Boston, Dr. McCarthy and I presented the various apparatus in use at the New York Post-Graduate Hospital. Since then we have had difficulty in continuing suction up to

the closure of the bladder; and for this reason the suction tube which I am presenting has been devised.

We have used the suction tube devised by Dr. Gile, but have found, first, that in thin individuals in whom the abdominal wall was thinner than the length of the tube, the tube would prevent closure of the bladder; second, it was difficult to clean this tube due to the fact that it is curved; and third no provision was made for an air inlet above the supporting plate. These three disadvantages we have tried to overcome by the tube I describe.

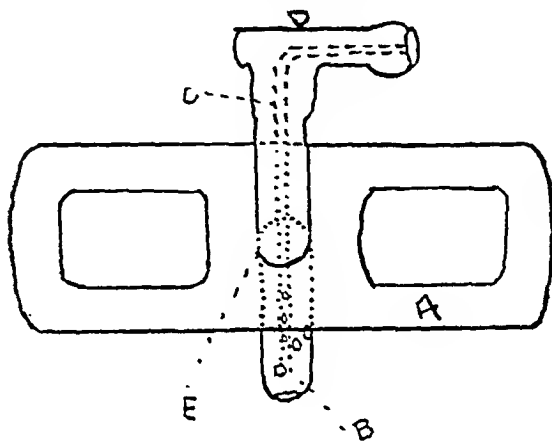


FIG. 1.

I should like to mention that Dr. H. B. Devine of Australia has described a tube similar to the one presented, differing in that no air inlet was provided above the plate (Fig. 1). The tube is composed of four separate parts: first a flat, oblong plate, with a central lumen, having a small cannula (E) for receiving the tube (B). Two lateral sections have been removed from the plate to diminish the weight and also to furnish a means of tying a tape so as to keep the apparatus in position.

The tube (B) is a simple metal tube which fits snugly into the cannula (E) provided for it in plate (A) and can be kept at the desired depth. There are several perforations arranged in a spiral at the lower third of the tube. At the upper extremity is a thread for screwing the tube into the cap (D). Just below the thread are two perforations permitting inlet of air, avoiding trauma to the bladder mucosa and surrounding tissues by the suction.

The inner tube (C) has a narrower lumen than tube (B) but essentially is the same. There are no openings below its thread, for it is the suction tube and suction is desired at the lower end. Its

lumen is a direct continuation of the lateral canal in the cap to which suction is applied.

The cup has a lateral tube whose lumen is a direct continuation of the lumen of the smaller perforated tube. The cap has two threads, one for the outer, protecting tube and a second for the inner, perforated suction tube.

Due to the facts that the depth of the tube is adjustable, that a vacuum in the bladder is avoided and that the tube can be very easily taken apart for cleaning, it has eliminated our former difficulties.

## A NEW TYPE OF FLUOROSCOPIC SCREEN FOR USE IN KIDNEY OPERATIONS

I. SETH HIRSCH, M.D.

The recording media at present utilized in examinations with roentgen rays are the sensitive silver emulsion and the fluorescent screen. The former gives a permanent, indelible image, and the latter a transient and evanescent one which disappears when the energization of the tube ceases. It seemed desirable for many reasons to possess a means by which the fluorescent image might be retained for prolonged intervals after the energization of the tube. Such a device could be applied, and utilized in many ways as an aid in the various radiological diagnostic procedures.

To this end, I devised a fluorescent screen which retains the image for a prolonged period, and discovered a method of reviving the image, when it has almost completely faded from view.

The screen consists of a fluorescent emulsion which may be spread, as usual, on paper, or on any other surface permeable to the radiation, such as aluminum, silver, etc. If the screen hitherto in use is such as gives the maximum fluorescence with the minimum amount of after-fluorescence, the screen I have devised may be considered as giving a maximum fluorescence and the maximum after-fluorescence, thus permitting reference to the image at any time, and a transference of this image away from the point of energization of the tube. Besides this, the fluorescence of the emulsion may be intensified by the application of heat and thus an image which, with time, has almost faded may be revived.

For the kidney examination at the operating table this method readily replaces either the fluoroscopic or radiographic methods now utilized. When the kidney has been partially

delivered and it becomes important to know the position, number and size of calculi, the fluoroscopic examination with the usual screen necessitates exposure during the entire examination. Under the best circumstances this examination at the operating table is difficult and, for obvious reasons, dangerous. The film examination of the partially delivered kidney is objectionable in that the development of the film takes an appreciable time before it may be viewed. The examination is, however, much simplified by the use of this screen.

For this purpose, a small hand fluoroscope has been devised, with a removable front which consists of a small metal photographic film holder, containing the screen.

This screen is sensitive to heat, light, ultra-violet light, roentgen rays and radium. Hence, it must be kept within its holder, and the slide must not be pulled out except when the holder is in the hood.

This being a method of fluoroscopy, sensitization of the eyes by darkness or dark glasses is necessary.

It is first necessary partially to sensitize the screen. The plate holder is removed from the hood and placed with the aluminum slide toward the roentgen-ray tube. The roentgen-ray tube is then energized for 2 seconds at a distance from the screen of 10 inches with 10 milliamperes of current. The cassette is then placed in a sterilized rubber envelope. The envelope is placed under the delivered kidney.

The roentgen-ray tube is placed at a distance of 8 to 10 inches from the kidney. With 10 milliamperes and 40,000 to 50,000 volts, an exposure of 10 seconds is made. The cassette is now removed from the envelope and slipped into the hood. The eyes are placed against the opening in the hood. The slide of the hood is withdrawn and the fluorescent image is viewed. The image will persist for 10 minutes under ordinary circumstances, gradually growing fainter. At the end of 10 minutes the screen may be used again. If it is desired to make an exposure of the screen immediately after the first exposure, the first image can be obliterated by exposure to the roentgen ray for 2 seconds or by exposure to the light of an electric bulb for the same time. The screen is then ready for another image.

I do not claim perfection for the method as yet. I am sure, however, that it has possibilities. By changing its salt content the screen may be made more or less fluorescent, and the



## THE MCCARTHY PUNCH

C. TRAVERS STEPITA, M.D.

This new instrument of Dr. Joseph F. McCarthy is a prostatic punch or median bar excisor that permits these manipulations under the guidance of the eye, and renders the operative field easily visible at all times.

The McCarthy punch consists of a large caliber beaked sheath with an obturator, used for introduction and removal of the sheath, which when introduced, obliterates the fenestra in which the median bar or prostatic lobe is engaged. The blade, or sharp circular tube plunger is worked with a pistol grip handle. This tube is detachable from the sheath by a bayonet joint, and the handle and cutting blade are easily removable. The McCarthy visual system is utilized, and it is to be noted that the light and lens do not move along with the cutting blade, but remain stationary. An irrigating attachment, which keeps the visual field clear with a continuous flow, is provided with the cutting part.

After biting out an intrusion, the blade and pistol grip are removed, the sheath remaining in situ, and the telescope together with an electrode and continuous irrigation system are introduced. In the clear field, the bleeding can be located and diathermized.

This cold punch with its accurate application under the guidance of the eye will remove large pieces of tissue leaving a clean incised area which heals quickly without the annoyance of delayed bleeding or the higher incidence of febrile reactions which one may find when the cautery blade is employed.

*[(No discussion)]*

## PRESENTATION OF SPECIMENS

BILATERAL HYDRONEPHROSIS WITH  
HYDROURETER CAUSED BY  
PHIMOSIS

C. TRAVERS STEPITA, M.D.

S. G., aged one month, admitted to the Post-Graduate Hospital as a feeding case, April 1, 1926.

Family history: Irrelevant.

Past history: Birth at 9 months. Labor normal. Except for constipation, the past history was negative. Fed entirely from mother's milk, every two to three hours. Appetite poor.

Present illness: The baby had been sick since

birth. Never took feedings well. Had been constipated, so mother had been giving one dram of castor oil daily. Had an umbilical hernia.

The chief complaints were vomiting, failure to gain in weight, and constipation since birth. No urinary disturbances noted.

Physical examination: General appearance that of a thin, premature baby of four pounds, cold, sick and rather cyanotic. Respiration normal. With the exception of some abdominal distention, physical examination negative.

Temporary improvement in condition under medical care, but condition gradually worse as severe cough developed. Died April 8, 1926.

Post-mortem findings: Body is that of a poorly nourished and emaciated male infant of one month. Abdomen considerably distended. Scrotum edematous and giving the appearance of a double hydrocele.

Both kidneys show marked fetal lobulation and are mottled purplish-red, especially in their lower portions. The right renal vein appears to be blocked with clotted blood. On section, both kidneys show a marked hydronephrosis, pelvis of each kidney being widely dilated with considerable thinning of the kidney substance, more marked in the left than in the right, the former being 4 to 7 mm. in thickness and the latter 8 to 10 mm. Both ureters are widely distended, with thinning of their walls, and very tortuous in their course.

The bladder is moderately distended to the size of an English walnut. The walls somewhat thickened, but the rugae are not marked. There is very marked phimosis, so that the prepuce cannot be retracted. The testes are very small and undescended, each lying in the abdominal ring. Each shows a slight hydrocele. Each serotal sac is distended with fluid to about the size of a pigeon's egg.

Microscopic: the kidney pelvis shows some fibrous thickening of the subepithelial tissue. The deeper portion of the stroma is edematous and thickly infiltrated with extravasated red cells. In the medulla the tubules are generally well preserved. Some of them are quite widely dilated. The intertubular vessels are deeply congested. In the cortex the convoluted tubules are distended and contain inspissated albumin, and rarely a hyaline cast. In many tubules the epithelium is well preserved, but in some of the cells appears ragged, and shows some disintegrated nuclei. The glomerular tufts are deeply congested and in some of the glomeruli the

capsule contains coagulated serous exudate. The intertubular vessels are much congested and the capsule shows edema and infiltration with extravasated red cells.

Summary: Bronchopneumonia of both lungs. Hydronephrosis of both kidneys, with marked distention and distortion of both ureters. Hydrocele of scrotum and both spermatic cords.

### Discussion

DR. A. HYMAN: This is the first case of this type that I have seen, although in the German literature there have been numerous reports of this condition. I would like to know, however, if Dr. Stepita is certain that there was no contracture of the internal urethral sphincter. Post-mortem, one can overlook a contracture of the neck unless the specimen is arranged in a certain way.

DR. C. T. STEPITA: Replying to Dr. Hyman, we found that the condition of hydronephrosis and hydroureter was due to the phimosis. Dr. Klemperer examined the specimen and came to that conclusion also.

## FIBROSIS OF THE RENAL PELVIS WITH HYDRONEPHROSIS

C. TRAVERS STEPITA, M.D.

G. F., male, aged twenty-three, clerk, Hebrew, was admitted to the Post-Graduate Hospital, December 15, 1926, complaining of dull pain in the right lumbar region, radiating to the right lower quadrant, and of fifteen months duration. Has had similar attacks for the past year, at intervals of two or three weeks. The attacks lasted approximately 12 to 18 hours, and were relieved by heat. No urinary difficulty after or during the attacks. No hematuria; no rigidity or tenderness of abdomen or lumbar region. The urine is macroscopically clear. Roentgenogram of the genitourinary tract shows no evidence of calculi. Cystoscopy shows a normal bladder and ureters; the posterior urethra engorged, irregular; otherwise negative.

Uteropyelogram of the right kidney, with 20 c.c. of 12 per cent solution of sodium iodide, injected by gravity: Examination shows marked pelvic dilatation, with a cystic-like appearance of the major calyces and further complete blunting and obliteration of the minor.

On December 17, two days after the patient's admission he was cystoscoped, both ureters were catheterized, and sterile specimens were

obtained for examination and culture. The urine from the left kidney was clear and the flow was normal. The urine from the right kidney was turbid, the flow constant, filling two test-tubes. Five c.c. of indigo carmine were injected intravenously. Appearance time: left kidney, 5 minutes, with a 4 plus concentration; right kidney, 32 minutes, with a quantitative estimation of  $\frac{1}{2}$  plus concentration. Cultures of both right and left kidney urines were found negative.

On December 21, 1926, the right kidney was removed by Dr. Joseph F. McCarthy, with the diagnosis of chronic, right hydronephrosis of kidney, and anomalous contracture at the ureteropelvic junction. The convalescence was uneventful, and the patient was discharged cured, January 5, 1927.

Pathological report: The specimen consists of the right kidney, which measures 12 cm. in length by 7 cm. in width, by 4.5 cm. in thickness. The capsule is thin and strips easily from the smooth renal surface.

The most conspicuous feature about the specimen is the moderately dilated pelvis which at the hilus of the kidney measures 2.5 cm. in diameter. This dilated pelvis tapers sharply to the beginning of the ureter, which is ligated as it bends sharply in a horizontal direction, but shows no gross thickening and readily admits a probe. Above the severance of the ureter 1.5 cm., the wall of the dilating pelvis becomes greatly thickened and stiff. The mucosa is finely granular and mottled with punctate elevated hemorrhages. Similar hemorrhagic spots are found less abundantly in the pelvis proper, as seen on longitudinal section. Aside from dilatation, the pelvis shows nothing of importance. The kidney structure shows nothing of note.

Microscopic report: There is marked fibrous increase in the mucosa and submucosa of the lower portion of the pelvis. This even involves the muscle layer and extends downward into the beginning of the ureter. Small scattered areas of extravasated blood show beneath the pelvic epithelium, but the sections are remarkable for the absence of cellular exudate. Section from the kidney tissue shows nothing of note, the histological picture being essentially normal.

Diagnosis: Fibrosis of renal pelvis and ureter. Hydronephrosis.

DR. PAUL W. ASCHNER: This case presents a few interesting points. We are probably dealing here with the end-result of some previous



infection. The fact that there was no stricture in the ureter or ureteropelvic junction may not negative stasis in the kidney. The musculature of the pelvis or ureter may become so infiltrated that the proper physiological peristaltic action of the pelvis and ureter may be put out of commission. This is a possibility to bear in mind to explain some instances of the dilatation and improper emptying in which we find no stenosis in the course of the ureter. Destruction of the musculature by fibrosis may be the important factor in such circumstances.

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*Meeting of April 20, 1927*

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## URETERAL STRICTURE: ITS ANATOMICAL AND PATHOLOGICAL BACKGROUND

MARTIN SCHREIBER, M.D.

*(Author's abstract)*

This study based upon findings in 100 unselected consecutive autopsies was undertaken to test, by both anatomical and pathological data, the conception lying behind that clinical entity which has been given the name of ureteral stricture. The evidence forming the basis for this concept has been, up to the present, for the most part indirect, that is, pyelographic and cystoscopic.

The following questions were to be answered:

1. Does there exist such a pathological entity as predicted by Hunner and his followers?
2. If it does, is its incidence as great as these reports would lead us to believe?
3. If it exists, what rôle, if any, does focal infection play in its etiology?
4. If focal infection is found to be not a factor, what is then the true pathogenesis?
5. What are the finer and yet gross "physiological," anatomical and structural forms that may give to pyelographic and wax-bulb methods those clinical signs which are interpreted as those of ureteral stricture?

The observations and conclusions in this report are based upon four types of

material: 1. gross anatomical and pathological dissections; 2. histological preparations; 3. autopsy records; 4. clinical records.

For histological material the entire pelvic ureter from the iliac zone of narrowing down to and including the pars muralis was usually taken with a more or less thick mass of subureteral tissue giving in continuity various zones of the ureter for observation and comparison.

In this series of 100 consecutive autopsies there were found 26 cases with some type of ureteral disease. Of the 79 adult autopsies, there were 25 cases, or 31 per cent, presenting some type of ureteral disease, a surprisingly large figure, emphasizing the relative importance of this structure in the general economy.

There was found an autopsy incidence of 13 per cent hydroureteronephrosis secondary to obstruction. Of these 13 cases, 12 were due to ureteral obstruction. The site of obstruction was a narrowing or stenosis in 10, and a dilatation coincident with or secondary to a postinflammatory scarring of the ureteral wall in 2 cases.

Of the 10 cases of stenosis, 5 or 50 per cent (or 5 per cent of the entire series) were of congenital origin. Of the remaining 5 cases, 2 were either caused by or were coincident with localized subureteral scarring in the region of the ligamentum latum, 2 were due to kinking of the ureter over anatomical structures (in one over the uterine artery, in the other over the vas deferens), and the remaining single case was the only one caused by a chronic fibrotic inflammatory process compromising the ureteral wall in such a way as to partially occlude its lumen. However, this localized fibrotic ureteritis (in the juxtavesical region) was definitely secondary to an active and intense acute and chronic cystitis. There was not a single case in which the lesion required the hypothesis of blood-borne focal infection for its complete explanation.

The author demonstrated 15 lantern slides showing the gross anatomical and histological findings in the above 12 cases;

the pertinent premortem clinical findings were included in the presentation of each case.

He also presented a series of lantern slides showing the possible anatomical sources of error in diagnosis, especially in the use of the wax-bulb "hang" method. The juxtavesical zone of narrowing deserves major emphasis, this region being not only a relatively constant site of ureteral narrowing, but also a constant site of increased gross density of the ureteral wall. Histologically, this density is seen to be due to an increase in thickness and density of the fibromuscular tunica, as compared with all regions above this zone.

The other physiological zones of narrowing to be emphasized are the pars arterialis, the pars vas deferens, occasional narrowing overlying the obliterated hypogastric artery, and redundant folds of mucous membrane, so-called valve formation.

#### CONCLUSIONS

1. Ureter stricture *does* exist as a definite pathological entity.

2. A 12 per cent post-mortem incidence of ureter stricture or stenosis corroborates the great number of ureter strictures or stenoses reported clinically.

3. Latent symptomless hydrouretero-nephroses due to ureter stricture or stenosis are of relatively frequent occurrence, as is evidenced by a post-mortem incidence of 10 per cent in this series.

4. Ureter stricture as a localized intrinsic inflammatory process in the ureteral wall, metastatic from a focal infection, apparently either does not occur, or is an extreme rarity as compared with ureteral strictures or stenoses of other origin.

5. Ureteral stricture or stenosis is most frequently found in the pelvic ureter in a zone about 2 to 6 cm. from the ureteral orifice.

6. As prime etiological factors in the pathogenesis of ureteral obstruction due to stricture and stenosis I would emphasize in the order named:

a. Congenitally accentuated narrowing of a congenitally physiologically narrow site.

b. Extension of inflammatory processes into the ureteral wall from (1) Adnexal disease, with and without thrombophlebitis; (2) advanced chronic cystitis.

c. The occluding kinking power of crossing anatomical structures—the vas deferens in the male, the uterine artery in the female.

7. The interpretation of the physical signs obtained by the wax-bulb hang method of Hunner, especially in that very important region 2 cm. to 6 cm. from the ureteral orifice, must always be conditioned by the physiological sites of narrowing and increased density of the ureter wall found in this region, namely:

a. The juxtavesical zone.

b. The iliac zone.

c. The ligamentum latum region—crossing of the uterine artery.

d. The vas deferens region—crossing of the vas deferens.

e. The site of the obliterated hypogastric artery.

f. So-called "valve formation" in the juxtavesical region.

#### THE RÔLE OF THE URETER IN DISEASES OF THE GENITO-URINARY TRACT

THOMAS J. KIRWIN, M.D.

This paper, presented with numerous lantern slides, will appear in a later issue of the JOURNAL.

#### Discussion

DR. GUY L. HUNNER: After two such papers as these, one is at a loss where to begin the discussion. When one has a large proposition to put over, he instinctively turns to the metropolis. This is true in matters of big business and is often true in philanthropic enterprises. So the urologists of the country, when they feel they have discovered something worth while, like to come before this society and have it passed upon.

It is needless to say that it has been a peculiar privilege and pleasure to me to listen to Dr. Schreiber's presentation of this unusual piece of work; and it is unusually interesting to me

to have had Dr. Beer, the man who sponsored Dr. Schreiber in this work. Dr. Beer has been one of the honest but very obstinate skeptics concerning the ureteral stricture concept; and to have him back a man who goes to Europe to demonstrate by autopsy findings that ureteral stricture cannot possibly have such incidence as has been claimed, and who returns with the report that he found it in 12 per cent of autopsies, is almost too convincing. It is well worth the trip to New York to learn what is Dr. Beer's reaction on this piece of work.

Dr. Schreiber undoubtedly showed cases of congenital thickening of the anatomical points of narrowing, and to have 5 cases of 12 put in that class, having no inflammatory reaction at all, certainly convinces me that I have been placing rather too much emphasis on the question of focal infections in speaking of the etiology of stricture. I have been well aware that in certain patients I could not find any focus of infection to account for the stricture, and this work shows that I have probably been emphasizing that factor too much. On the other hand, while Dr. Schreiber comes to the conclusion that his autopsy work shows no reason for ascribing focal infections as the cause of stricture, I am sure that he will soon find that his clinical work varies from his autopsy work, for he will be unsuccessful in many of his clinical cases if he attempts to give them adequate permanent dilatation without taking into account distant foci of infection. In many patients presenting ureteral stricture and a manifest distant focus of infection I have deliberately ignored the possible relationships between the two, until I have given what should be adequate ureteral dilatation, only to find that many patients had to be referred for attention to the focal infection before the stricture areas would remain permanently dilated.

It requires much patience to study and record our clinical activities properly if we wish to have results of scientific value. If we begin by several lines of attack at the same time and end with good results, we cannot estimate the relative value and effects of each therapeutic measure employed. It has, therefore, been my practice to try out patiently one line of treatment at a time.

As to the interpretation of the 7 cases Dr. Schreiber reports associated with mechanical and inflammatory conditions, only careful future work can finally show us the real significance of these various factors. Some of his

cases were apparently associated with scars and inflammatory conditions in the subperitoneal tissues, and it is quite within the range of possibility that these represented past inflammations derived from distant foci of infection. Some of his specimens were manifestly associated with a gross pathologic process in the genitalia. As a gynecologist I have constantly been surprised at the few ureteral stricture lesions that seem to be secondary to gross disease of the internal genitalia. This is one of the reasons that has influenced me in concluding that most of the inflammatory strictures are secondary to a distant focus of infection. Be that as it may, there are papers now appearing frequently on the pathologic aspects of ureteral stricture; and in time we may hope to have many of these questions answered. Meanwhile, I think we are all agreed that Dr. Schreiber has done a fine piece of work, the most telling by far that has yet appeared in relation to ureteral stricture.

One stumbling block to those who have not investigated this question clinically has been the large number of cases reported by all those who have made systematic inquiry, and if stricture can be found in 12 per cent of autopsy cases everyone must admit that it is a disease of frequent incidence. Some of us are old enough to remember with what reluctance the profession as a whole admitted the frequency of gallstone disease. As soon as the pathologists told us that gallstones were found in 10 per cent or more of autopsies on adults, the diagnosticians were forced to give up the idea that this disease was merely a fad of the surgeons, and they then gave more attention to its clinical diagnosis.

Not only has Dr. Schreiber demonstrated that ureteral stricture is a common lesion, but he has answered one of the stock questions of those who have been content to argue instead of investigate, namely, "Why have not the pathologists found stricture if it occurs so frequently?" From the beginning of this work I have had to do a few retrograde dilatations of stricture, and in the course of pelvic and abdominal operations I have had opportunity to study ureters previously treated for stricture, and seeing and handling strictures *in vivo* has convinced me that the pathologist would find them as soon as he looked for them.

Another stock question has been, "If stricture is due to focal infection, why is it not found in the male?" My answer has been, "Why was

stricture not found in women until it was looked for by methods that would demonstrate the lesion if present?" Later Folsom, Goldstein, Livermore and others showed that stricture is prevalent in the male; and I consider this question as finally answered by Rathbun, who in his Brooklyn clinic in 1924 diagnosed 92 cases of stricture, 48 in men and 44 in women.

I think the most important question relating to ureteral stricture now before urologists for their solution is the correct interpretation of their roentgen-ray films. While I thoroughly enjoyed Dr. Kirwin's scholarly paper and his remarkable series of slides, yet I have to differ with him in the interpretation of many of them. He showed many slides demonstrating stricture in the lower ureter, and redundancies in the upper ureter, some of which he emphasized by taking the film with the patient in the erect posture. He seems to place far more emphasis on these prolapses of the upper ureter than I would. The distensible ureteral tube dilates in both the lateral and vertical axes, and its increase in length is bound to result in an irregular course of its usual relatively straight axis, particularly in its upper few centimeters which normally are most free from surrounding supports. This leads to what many urologists still speak of as kinks, and ascribe as the cause of the kidney affection. I look upon most of these angulations as "roentgen-ray kinks," and their innocuous character is demonstrated by ignoring them and relieving the patient's symptoms by dilating the stricture in the lower ureter.

Of course we do find some pathologic angles of insertion, especially in the larger hydronephroses: actual strictures of the upper few centimeters of ureter, periureteral bands causing actual obstruction by pressure or suspending action, secondary interference by anomalous vessels, and compressions by perirenal infiltrations; but these are relatively few as compared with the many simple redundancies of the dilated upper ureter, and careful urogram reading is a great help in our prognosis to the patient as to whether simple dilatations will relieve their symptoms or whether they are facing an operation.

Another problem which the urologists must study deals with the traditional view that any obstruction in the lower ureter, which leads to stasis and symptoms must register on the roentgen-ray film as a grossly dilated tract above. Logically this traditional view is correct, but, as occurs so often in medicine, logic and facts

do not always coincide. I shall show a series of slides that have been diagnosed by our roentgen-ray department as normal. Inasmuch as that department has been trained by our urological department in this field of interpretation, it is not surprising that these films have been read as normal, but I submit that it is of decided moment to the patient whether the urologist and roentgenologist decide that he has a serious lesion of the urinary tract that can be relieved in a simple manner by the urologist, or whether he is submitted to a serious but useless abdominal exploratory operation, or perchance to several weeks or months of an expensive rest cure.

The use of the bulb is a simple and logical method of determining whether a patient has stricture, whether this is single or multiple, annular or diffuse; and with the data obtained by the bulb we are in a position to make a much more accurate interpretation of the roentgen-ray film. As a matter of experience the most painful strictures to treat, and the most obstinate in yielding to treatment, are those accompanied by so little dilatation above the stricture area that they have always been interpreted on the urogram as normal.

There is other evidence than that furnished by the bulb and the slightly altered urogram to convince the urologist that he is dealing with one of these hypersensitive types of ureteral stricture. After the investigation with a plain catheter a patient with this type of obstruction often has the so-called ureteral chill, and extreme kidney colic accompanied by nausea and vomiting, and an exaggeration of whatever symptoms the patient previously complained of. Temporary relief of the previous symptoms following this severe reaction is suggestive. Improvement in the general well-being during the dilatations, and final recovery, are all phenomena that, seen in a sufficient number of cases, convince the urologist that he must break from the traditional method of urogram reading and properly interpret certain slight variations which he has been taught to overlook.

DR. N. P. RATHBUN: No subject in urology has brought up so much discussion, amounting at times almost to rancor, as this question of ureteral stricture. I have always felt that where there was so much smoke there must be some fire, and when we see men group themselves on two opposite sides of a subject it is fair to say that neither group is entirely right or entirely wrong. The slides that Dr. Schreiber

exhibited are very interesting, particularly those that showed inflammation in and about the ureters; I have in mind one which extended into the ureter wall. I have always differed with Dr. Hunner on the subject of focal infection. I believe that this is not necessarily the most prominent cause; that stricture might well occur from inflammatory conditions in adjacent regions, etc. Then, too, I have always felt that some strictures are part of an ancient pyeloureteritis that left scars. None of the slides of Dr. Schreiber will show that; and yet if he had another hundred autopsies he might find some such condition.

Another question, entirely apart from Dr. Hunner's bulb and the pyelogram, is the clinical picture and the results of dilatation. I don't see how you can ignore the fact that if patients come with the story of pain, etc., and after dilatations say that they are better than for years, that is very convincing. The slides that Dr. Hunner has shown demonstrating increase in the phthalein output and increase in the functional capacity of the kidney are very convincing. I lay no claim to infallibility nor do I believe Dr. Hunner does. I assume that I have made a diagnosis of stricture of the ureter a number of times in which no such condition existed and I have no doubt that Dr. Hunner is quite willing to admit that he has done the same. I think it is equally possible that a number of men who have scoffed at the idea of such a condition have missed a number of strictures because they have not looked for them. For many years every patient that I have seen who complained of pain has received a complete and thorough investigation, including pyelography and ureterography. For many years I have seen no reactions that caused disturbance. I have done it many times and have not done the patients any harm, and many times I have picked up points that might otherwise have been missed.

DR. EDWIN BEER: This is such an harmonious love-feast that it would be very ungracious on my part, I fear, to interfere in any way with its general tenor. I am encouraged, however, to make a few remarks, in view of the fact that some of the speakers have indicated that they are not in perfect accord on all matters.

Dr. Hunner, in my opinion, has not entirely proved the frequency of strictures of the ureter, that they are due to focal infections, and that they can be diagnosed by the wax-bulb hang. As he admits logically, if there is a stricture of

the ureter, the proximal part of the ureter should be dilated, but he states that he has seen strictures as diagnosed by the wax-bulb hang method without any such dilatation. Is not this evidence that he is reasoning somewhat in a circle? All the more so, as Dr. Schreiber's interesting pictures showed regularly the dilatation, or almost regularly, behind the parts which he considers abnormally narrow.

This discussion reminds me somewhat of the discussion we used to hear of large calibered urethral strictures. If a No. 6 to No. 8 French catheter passes readily up the ureter without encountering an obstruction or finding a retention, are we justified in concluding that such a ureter is strictured? Dr. Hunner would state that on withdrawing a large calibered waxed bougie, if one feels a hang in using his technique—despite the fact that there is no obstruction going in—one must conclude that there is a stricture. What causes the bulb to hang I don't believe has been proved, nor has it been proved where the bulb is caught in this hang. Most of the obstructions seem to be found close to the bladder wall, perhaps some of them intramurally, according to the data that Dr. Schreiber has shown us; and I, personally, have encountered such cases due to extraureteral disease in the parametrium, perivesiculitis, pelvic osteomyelitis, and the like, as well as in the more common types of stricture due to tuberculosis and ulceration following ureteral stones that have remained *in situ* for a long time.

It is hard to see how Dr. Hunner could have collected such a large number of cases as 2500—most of them with bilateral strictures—unless this is a very common condition. Stimulated by his writings and those of numerous others, my associates and I have been looking for it but have failed thus far to find any large number of ureteral strictures. One would expect by forcible dilatation of such ureteral strictures to get violent reactions with closure of the ureter, just as one gets them in strictures of the urethra, but apparently the whole stretching process is somewhat innocuous in most cases. There is no doubt that every once in a while the passage of an instrument up the ureter gives the patient a certain amount of relief, which I am inclined to attribute to the effect on the intramural ureter, or perhaps to the displacement of a small calculus, or the establishment of better drainage.

I am glad to say that I am in harmony with Dr. Hunner on the subject of ureteral kinks

which used to be considered the cause of all sorts of symptoms. Unless these kinks are fixed by a periureteritis, in my opinion they rarely produce symptoms.

This whole subject of ureteral disease is a most interesting one, and no one has done more than Dr. Hunner to focus our attention on these conditions. Still, I must conclude by saying that I am as yet not convinced that he has proved his point that strictures are very common, that they are bilateral usually, that they are due to focal infection, that they can be recognized regularly by the wax-bulb hang, and that the ureter behind the stricture does not have to be dilated.

DR. O. S. LOWSLEY: Dr. Schreiber's paper is a valuable contribution to this general subject, and Dr. Kirwin's paper is the kind that one likes to have on hand for frequent reference. It contains many points of importance in the various discussions of ureteral lesions. One of the most amazing points in Dr. Schreiber's paper is that 35 per cent of adults in this consecutive study showed ureteral lesions. That is a piece of news to all of us, including Dr. Hunner. I don't believe he thought that nearly so large a number of lesions would occur in an autopsy series. The fact that 12 per cent of Germans had some stricture of the ureter certainly has removed that condition from being an American disease, as they tell us with a shrug of the shoulders.

Dr. Kirwin showed an important picture: the one which demonstrated beyond any question the appearance of a peristaltic wave. Some of these narrowings that we have shown as strictures have been called peristaltic waves. We have made a study of them, and they are always  $2\frac{1}{2}$  or 3 inches in length. As we make five roentgenograms we always pick up the peristaltic wave, and are able to recognize the difference between that and other conditions.

I quite agree that distortions have no significance, but I cannot agree that the real kink has no significance, especially where the kink appears only when the patient is erect. The reason that is not to be passed by lightly, as Dr. Hunner and Dr. Beer seem to think, is that recently we have been making studies of patients who have been operated on for appendicitis and not cured of their troubles. When a patient has a lesion of that sort and is cured by putting a belt on and by dilating with bougies and catheters, it has great significance to me. We have not 1 or 2, but 35 or 45 such cases; and the general

surgeons have gotten into the habit of sending all patients to the urologist before instead of after operating on cases of chronic appendicitis. I feel that real kinks that cause obstruction, occurring with hydronephrosis cannot be passed by as inconsequent; they are of great consequence, and the patient is relieved by elevating the kidney.

DR. R. L. DOORMASHKIN: I have a few lantern slides to show the relation of a stricture to formation of stone, and also to show what may be called a novel way of demonstrating a ureteral stricture by means of the rubber bag.

The evidence I have so far obtained would fail to support the claim of Dr. Hunner and his followers that strictures are found in practically all cases of stone in the ureter. It is true that in the earlier phases of the work I did not resort to ureterograms because I thought that the amount of information obtained was not commensurate with the amount of possible damage that may be done to the kidney by injecting an irritant solution in the presence of an obstruction below. But since the rubber bag was introduced it was possible to obtain some idea of what is going on in the ureter.

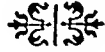
Even before the rubber bag was used, the strongest argument against the stricture theory in stone formation was the fact that the stone would recur after ample dilatation of the ureter. In some cases, the ureter was dilated up to 18 or 20 F. Certainly, these patients were free of stricture and yet they continued to manufacture the stones.

DR. SCHREIBER (closing): I wish to point out several facts relative to Dr. Beer's remarks concerning the necessity of finding dilatation behind an obstructive lesion in the ureter. In several cases of prostate hypertrophy, the pathological data and slides of which were not presented here, there was found a definite narrowing with thickening of the ureter at the site of crossing of the vas deferens. (This type of obstruction has been well described from both the clinical and pathological sides by Tandler and Zuckerhandl.) In these cases, no dilatation of the ureter was found behind this narrowed zone, but instead there was seen a gross increase in the thickness and density of the entire pelvic and lumbar ureter. This gross increase in density was found to be due to a remarkable hypertrophy of the muscularis with an associated coincident deposit of dense intermuscular connective tissue. These cases apparently showed

a compensatory muscular and connective tissue hypertrophy in the ureteral wall behind a continued, or gradually increasing, partial obstruction.

It is my belief that this runs parallel with a general biological formula applicable to all smooth-muscle hollow viscera, namely, that the first result of a continued incomplete obstruction is a compensatory hypertrophy of the muscularis behind the obstruction. Dilata-

tion occurs only as a result of decompensation, due either to too great a narrowing with too great a rise in intraureteral tension, or to destructive changes (inflammatory or circulatory) in the wall. Dilatation means decompensation with more or less urinary stasis. Lack of dilatation does not rule out an obstructive lesion, for an increased intraureteral tension due to an obstructive lesion may be compensated for by a resultant hypertrophy.





# TRANSACTIONS OF THE SECTION OF ORTHOPEDIC SURGERY NEW YORK ACADEMY OF MEDICINE

*Meeting of March 18, 1927*

THE CHAIRMAN, DR. HARRY FINKELSTEIN, PRESIDING

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## THE STABILIZATION OF PARALYTIC FEET WITH SPECIAL REFERENCE TO GRAVITY FLEXION: AS BASED UPON THE ANALYSIS OF 213 CASES

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IN any program for stabilization of paralytic feet, every factor must be duly regarded, or the end-results will not be satisfactory. Not only the foot itself must be considered, but also the relation of the foot to the leg, and the mechanics of impaired function in both lower extremities and the spine. However, the problem of stabilization will be discussed only as related to the facts elicited in 213 cases that have been carefully observed during the past five years, when associated with the author's operation for drop-foot. A preliminary report of this procedure was made in 1923 before the American Orthopaedic Association, and a second report was made before the Orthopedic Section of the American Medical Association, in 1925, after more definite conclusions had been reached. As approximately five years have now elapsed since the first operation, sufficient evidence has been acquired to determine the real value of this procedure. Also, material knowledge has been gained from postoperative observation of associated procedures, as arthrodeses of the tarsal joints. The correction of gravity flexion or drop-foot, and the operative technique thereof will be discussed first and, following this, the necessary accessory procedures on the forefoot and tarsals.

Gravity flexion, or drop-foot, is the

inability to dorsiflex the ankle joint or foot, and is the result of any agent that impairs or abolishes the muscular power in the anterior group of leg muscles. The etiological factors are: destructive changes in the muscles and tendons, toxic neuritis, as in lead poisoning, trauma to the external popliteal nerve, spastic paralysis and, most frequently, poliomyelitis, or infantile paralysis. Drop-foot may be simple, when only the anterior muscles of the leg are involved, or it may be associated with varus, valgus or flail-foot, if loss of muscle power is more extensive. As the anterior muscles of the leg are more frequently paralyzed than any other muscle group as a sequela of poliomyelitis, inability to dorsiflex the foot is very common.

All operative procedures, with the exception of the one under discussion, attempt to suspend the foot from the anterior aspect of the leg by silk cords, paralyzed tendons, transplanted fascia lata, etc., but the result of such methods is uncertain and often disappointing, as the constant force of gravity by the pendulous foot causes elongation of the improvised ligaments, with recurrence. It has become so universally recognized as to be an axiom that paralyzed tendons will not permit stress.

Prior to my first article, in 1923, there had been no claim to the prevention of



drop-foot by arthrodesing operations of the foot, nor has an operation on the mid-tarsus ever been effective in correcting gravity flexion. I tried repeatedly to deviate the foot upward at the junction of the body and neck of the astragalus after removing the neck and a corresponding portion of the calcaneus and cuboid, but it was found mechanically impossible to prevent drop-foot successfully in this manner.

In a small proportion of cases, it is possible to limit gravity flexion by back-

after observing for two years the results in many large clinics of America, made a comprehensive report in 1921, to which reference may be made. They concluded that reconstruction operation on the skeletal system proper was essential in a large percentage of paralytic feet, such as astragalectomy and arthrodesing operations of the tarsus with backward displacement of the foot, following the principles promulgated by the late Gwilym G. Davis, of Philadelphia. At this time,

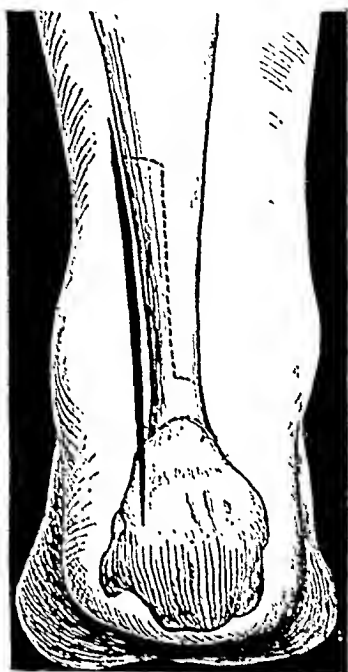


FIG. 1. A. Skin incision for bone-block operation.

ward displacement of the foot, but this is not a dependable procedure and requires too extensive dissection of the malleoli. Whitman's astragalectomy is an excellent procedure and a dependable measure for the correction of drop-foot in flail-feet or lateral deviations, but is seldom indicated in the type under consideration. Panarthrodesis of the astragalus limits plantar flexion by obliterating all motion, but the disadvantages of a stiff ankle are well known.

In 1919, the American Orthopaedic Association appointed a committee which made a most exhaustive investigation of the various operative methods for paralytic feet, and their end-results. This committee,

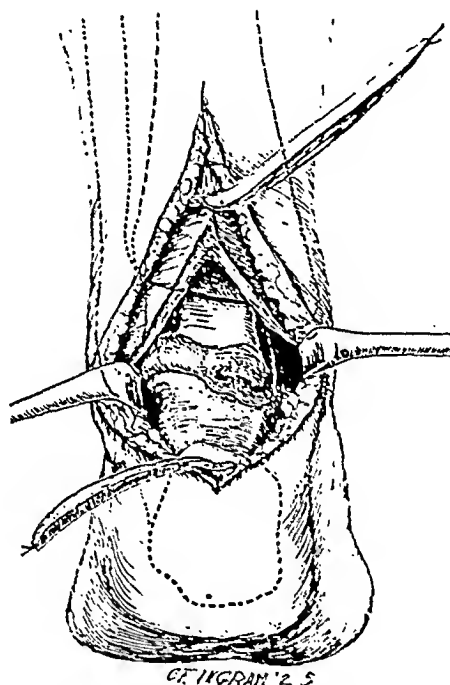


FIG. 2. Pyramidal space showing superior surface of os calcis and posterior aspect of ankle joint.

the views expressed by this committee were apparently the crystallization of opinion of the surgeons present, which had been evolved by years of experience. This committee, very clearly states regarding gravity flexion, or drop-foot: "None of the operative measures considered can be confidently recommended as a standard procedure."

In 1922, the first operation for the correction of drop-foot by the bone-block method was performed upon a child, aged nine years, with excellent results to the present time. Since then, this procedure has been carried out routinely when necessary, in conjunction with other measures

for stabilization of feet, and occasionally independent of other measures. The entire object of this operation is to construct a stop-joint, by transplanting or building up a mass of bone on the superior surface of the os calcis, thus forming a permanent bony process limiting plantar flexion by impingement on the posterior surface of the tibia. The technique is as follows:

The skin incision is made over the tendo Achillis, if this structure is contracted; otherwise, to the outer or inner side, as

astragalus and the posterior portion of the articular surface of the tibia. The posterior extremity of the astragalus is removed with a curved chisel, so as to permit close approximation of the graft and an intra-articular, as well as extra-articular block. A cavity is made on the superior surface of the os calcis just posterior to the ankle joint for reception of the large graft, as will be shown later. Bone is next transplanted from any portion of the skeleton. As it is usually necessary to enter the forefoot for the

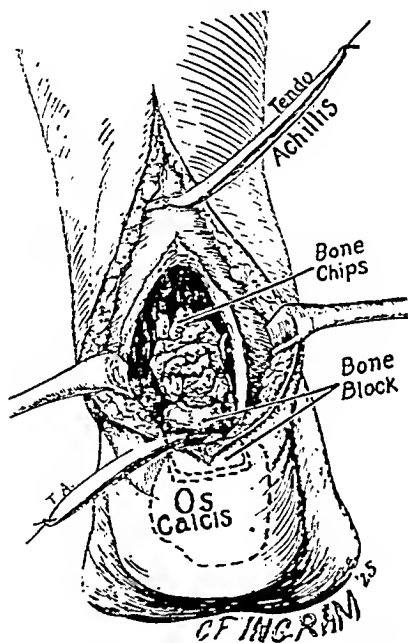


FIG. 3. Multiple bone grafts transplanted into pyramidal space.

convenient. It should extend from the superior aspect of the tuberosity of the os calcis upward for three or four inches in a straight line. If the tendo Achillis is contracted, severance is made by the plastic method. A straight incision is next made in the midline to the posterior portion of the ankle joint, retracting inward the tendon of the flexor longus pollicis. With a heavy periosteal elevator, a pyramidal space is cleared, exposing the posterior surface of the tibia, ankle joint, subastragalar joint and superior surface of the os calcis. The foot is dorsiflexed, bringing into view the posterior extremity of the

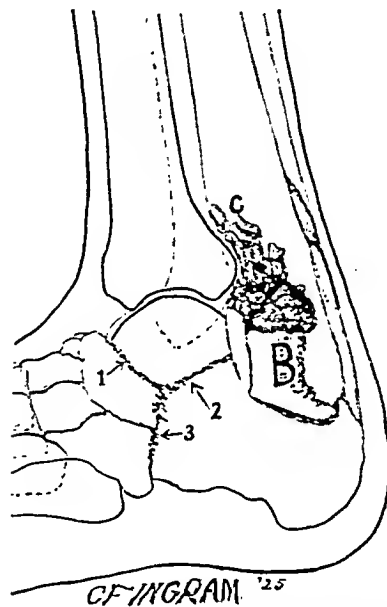


FIG. 4. Diagram, side view, showing bone-block in position approximate to and within ankle joint. B, bone-block. C, bone chips. 1. Astragaloscaphoid arthrodesis. 2. Subastragalar arthrodesis. 3. Calcaneocuboid arthrodesis.

purpose of stabilization by arthrodesis—bone is often excised in the process, and can be utilized as transplants. Spongy bone is believed to adapt itself more naturally than dense bone from the tibia, though a tibial transplant was successfully employed in one case and has been advocated recently by Leo Mayer. Transplants from the femur, when the case is complicated by genu valgum, and from the ilium, in transferring the crest in hip flexion contractures, have also proven satisfactory. If bone is excised from the forefoot, it is

denuded of cartilage, and a piece about one-half by one inch in diameter is placed in the cavity prepared on the superior surface of the os calcis, about which small particles are arranged in a pyramid. The cartilage is removed and placed in mosaic fashion to cover the posterior, inner and outer aspects of the pyramid, to prevent adhesion to surrounding structures; this step, however, is by no means essential, as the results are as good when bone is obtained elsewhere, free of cartilage. The

a part of the os calcis and often fusing the os calcis to the astragalus, stabilizing the subastragalar joint. Plantar flexion is thus prevented, as the olecranon process limits extension of the normal elbow. The technique may be modified when the forefoot is stable, by turning forward the upper third of the os calcis, when, incidentally, it is possible to do a subastragalar arthrodesis, or even the horizontal section of Davis, with backward displacement of the foot by the posterior route.

It is also possible to transfer particles of bone from the midtarsal region through the subastragalar joint to the superior surface of the os calcis, in performing a triple arthrodesis, but the block cannot be so accurately placed as when the posterior incision is employed, and the results in a limited number of cases have been so unsatisfactory as to cause this method to be discarded.

Stabilization of the tarsus by osseous fusion, with correction of existing deformity, obviously renders the bone-block more effective. The extent of fusion required varies. In some cases, only the midtarsus, the astragalocaphoid and calcaneocuboid must be fused, whereas, in others, a triple arthrodesis is necessary, which is fusion of the calcaneo-astragaloid, calcaneocuboid and astragaloscaphoid articulations. Bony fusion is best accomplished in the following manner:

An anterolateral incision is made, beginning about one inch above and to the medial side of the fibula. This is carried straight downward to the anterior aspect of the external cuneiform bone. Through this incision free access is available to the astragaloscaphoid joint and the subastragalar and calcaneocuboid joints. The necessary amount of bone is removed at these points to correct the deformity, if present, after which the foot is displaced backward at the subastragalar joint, as far as possible. However, such backward displacement is often a myth, being more apparent than real; in fact, the removal of a section from the midtarsal region shor-

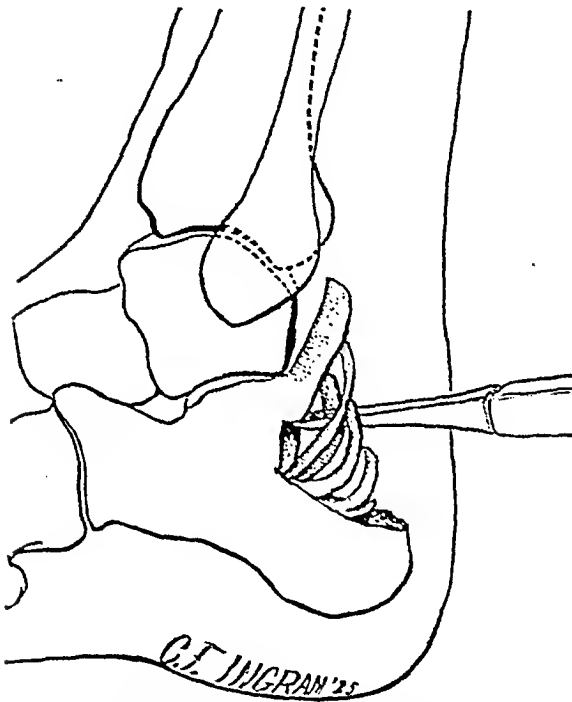


FIG. 5. Modification, which has proven satisfactory in a number of cases, by simply turning up a large flap from the os calcis.

soft parts are sutured snugly to retain the transplants in situ, the tendo Achillis is united, if severance is required, and the fascia and skin are closed. The foot is then held by a plaster cast at an angle of 90 degrees with the leg. Overcorrection is especially avoided, as it is preferable to secure a slight degree of plantar flexion in order to avoid flat sole or heel walking. At the end of eight weeks, the cast is removed and a roentgenogram is made, which usually demonstrates proliferation. A sequence of roentgenograms exhibits a gradual organization of bone, until there is a solid mass continuous with and forming

tens the forefoot and changes the relation between the forefoot and heel, giving the appearance of a backward displacement and a more prominent heel, in comparison with its appearance prior to operation. In order to obtain much backward displacement, there must be a dissection of the ligaments from both malleoli. This requires extensive dissection and is unnecessary when the bone-block is employed.

With the bone-block operation, a subastragalar fusion is accomplished; there-

many small loose fragments. In applying the cast, close bony approximation at all points must be secured and maintained indefinitely.

Tendon transference, when indicated, has been employed, also other procedures in the feet, as Steindler's operation for cavus and Dickson's operation for claw-toes, but these are dismissed with brief mention, as space will not permit full discussion of all collateral procedures.

As in all orthopedic affections, the after-

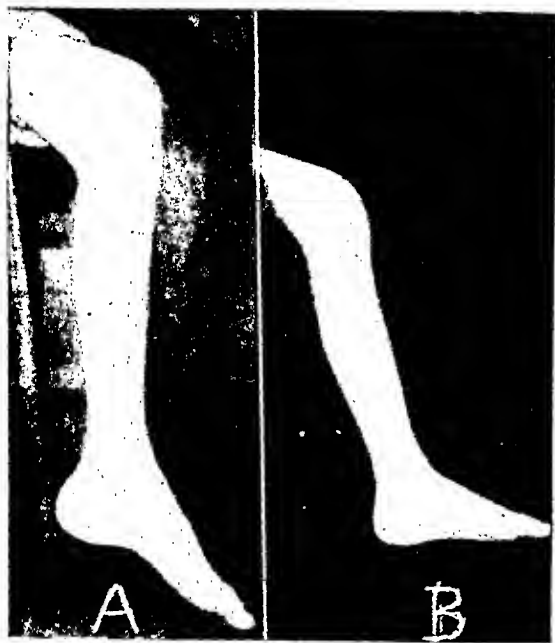


FIG. 6. A. Simple drop-foot in a child, resulting from anterior poliomyelitis. Note gravity causes equinus. B. Same case, after arthrodesis of the midtarsal joints and bone-block. Note that foot is blocked at right angle to leg.

fore, in a larger proportion, only the mid-tarsal region is attacked. In all cases where the astragaloscaphoid joint is fused, the corresponding calcaneocuboid must be fused in a like manner and great care must be taken in excising such an amount of bone as will permit coaptation of all raw bony surfaces and avoid dead space. After coaptation, in attempting to arthrodesis these joints, osseous fusion will be brought about in a larger percentage of cases if the raw surfaces are roughened extensively with a chisel, so as to leave

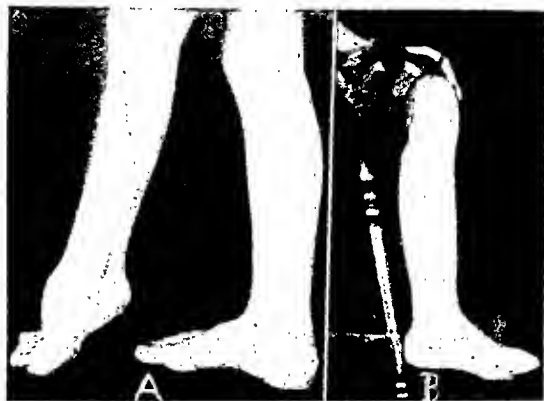


FIG. 7. A. Rigid equinus deformity of foot in a child following anterior poliomyelitis. Note contracture of tendo Achillis. B. Same case, after triple arthrodesis, lengthening tendo Achillis and bone-block.

treatment is most important. Success depends largely upon osseous fusion at various points. At the end of three weeks, the cast is changed and the position of the foot is noted, any irregularity being corrected. A roentgenogram is made to determine the relation of bones to each other. If, through error in the application of the cast and holding of the position of the foot, space between raw surfaces is permitted, approximation can be made at this time by slight force under gas anesthesia. Again, at the end of eight weeks, the cast is removed, when, by passive motion and the roentgenogram, progress of osseous fusion is ascertained. If this is efficient, drop-foot day and night braces are made and weight-bearing is permitted. If osseous union is retarded, the treatment should be the same as for delayed union in frac-

ture; the conditions are analogous. This treatment consists of the application of the third cast, great care being exercised in molding the arches. Weight-bearing is then permitted from four to six weeks, when osseous union is usually firm. The foot is protected by apparatus limiting plantar flexion until the roentgenogram demonstrates that osseous union is not only firm but well organized at all points and the structure of the bone approaches normal with decreasing osteoporosis. Close atten-



FIG. 8. A. Equinovarus deformity of right foot. B. Same case, showing an arthrodesis, drop-foot operation, and transplantation of tibialis anticus tendon to outer side of foot. Note foot blocked at 90 degrees on the leg.

tion to such details increases the proportion of permanent and successful results. The roentgen ray should be employed routinely, as it is a most valuable agent in determining postoperative treatment, the prognosis and end results.

The scope of the procedure is apparently not fully appreciated, though it was mentioned in the first report. The operation is employed not only in simple drop-foot, but whenever drop-foot is associated with other paralytic deformities. The indications are as follows:

1. Simple drop-foot, as a result of paralysis of the anterior group of muscles of the leg. The midtarsal joint is usually abnormally lax and requires stabilization, which necessitates the excision of bone that may be utilized as transplants.

2. Partial drop-foot, as evidenced by from 25 to 50 per cent of normal power, but not sufficient to dorsiflex normally. If the midtarsal joint is stable, the bone-block may be accomplished by turning forward a flap from the os calcis.

3. Rigid equinus. In this condition, the anterior group is partially, if not totally, paralyzed. Permanent limitation of plantar flexion prevents strain and increases endurance.

4. Equinovarus. The varus is corrected



FIG. 9. Roentgenogram of foot after midtarsal arthrodesis and drop-foot operation. Note fusion of astragalo-scaphoid and calcaneocuboid joints; also, osseous process fused to the os calcis and astragalus and projecting upward posterior to tibia.

by tarsectomy, when sufficient bone is obtained for transference.

5. Equinovalgus. When there is paralysis of the anterior muscles, a tarsal resection is often indicated in this condition. From the resection, sufficient bone for transference is available.

6. Flail-foot. As an addition to the Davis, Dunn, Ryerson or Hoke procedures, the transplant described above makes certain perfect stabilization. Backward displacement of the foot at the subastragalar joint alone will limit plantar flexion at times, but is not dependable.

7. As an adjunct to various combinations of tendon transference, especially the

reattachment of the extensor longus digitorum to the tarsal region.

8. Spastic paralysis, or hemiplegia, with overactive heel cord. In these, recurrence of deformities is notably frequent.

9. In children over eight years of age. Prior to this time, stabilization operations are rarely indicated.

In determining the end-results of the bone-block operation, much knowledge has been acquired in other phases of stabilization. Roentgenograms were made occa-

The cases of children and adults will be separately considered, as the bones of the developing organism are different in quality from those of a matured adult, and the growth element may affect the permanency of results of any surgical procedure.

Of the 213 cases in which bone-block operations were employed, 104 were in children and 109 in adults. Of the 104 in children, 76 met all requirements in determining the end-results, while in 28, either sufficient time had not elapsed since



FIG. 10. Roentgenogram after drop-foot operation. This shows the posterior block which was obtained from turning of a flap on the superior surface of the os calcis. The tarsal region was not invaded.



FIG. 11. Roentgenogram of foot following triple arthrodesis and drop-foot operation. The process is too far posterior to the joint, but apparently the desired result was accomplished. This case also shows a marked degree of flat-foot, though solid bony fusion.

ionally during the first two years after the operation was originated, but with increasing frequency. Since the past year, this method of investigation has been employed routinely in all operations for stabilization of feet.

The clinical observations in 213 cases will be considered, but in only 86 of this number are roentgenograms available, for the reasons above stated. In every case accepted as to analysis of final results, clinical observations were made by my colleagues, Dr. J. S. Speed and Dr. Joseph I. Mitchell, and in most instances, by one of my colleagues and myself; no hearsay evidence, by letter or otherwise, has been accepted.

operation to reach a conclusion, or the patient was not available for observation. Of these 76, 71 obtained excellent results, the bone-block being effective and preventing plantar flexion by impingement of the block either against the posterior aspect of the tibia or the rim of the posterior extremity of the articular surface of the tibia. There were 5 failures, 3 of which were due to improper technique at operation, as demonstrated by the roentgenogram. The transplants in these were either insufficient or were placed too far posterior to the ankle joint to be effective in preventing plantar flexion. In one, a good result was apparent after a few months, with a

gradual dropping of the foot downward, though the size and relation of the bone-block was satisfactory. This apparent relapse was caused by increased relaxation of the ligaments of the ankle joint, as the triple arthrodesis was united by osseous fusion. In one, the ligaments were intact and the bone-block in place, but apparatus was discarded too early, with the result that the unorganized graft and callus permitted plantar flexion by the constant force of gravity and consequent recurrence.

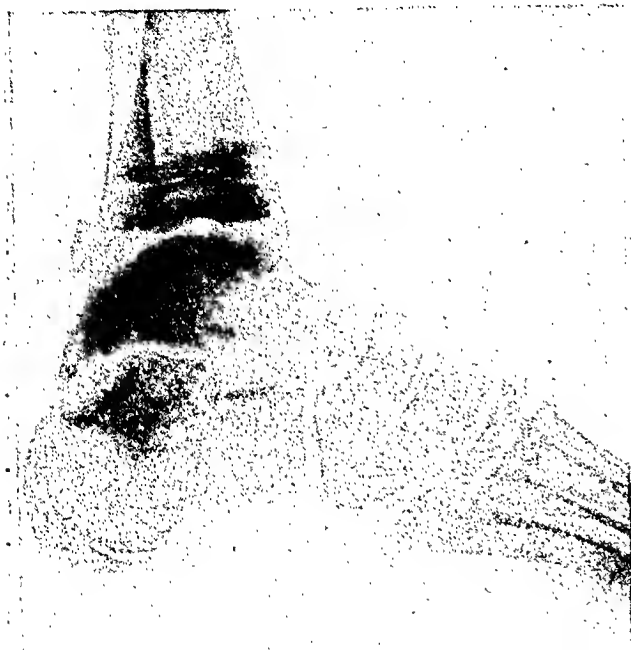


FIG. 12. Roentgenogram of foot following drop-foot operation. Most efficient mechanical blocking was obtained.

However, the roentgen-ray pictures demonstrated an apparently good result.

In 5 cases, the forefoot possessed normal stability, hence the bone-block was made by turning up flaps from the posterior surface of the os calcis. Four were successful and one was a failure, on account of error in operative technique. In 6 children, the operation was bilateral and carried out at different sittings, each foot being estimated as a separate operation. In 2 there was fusion of the block to the posterior aspect of the tibia, causing a solid bony ankylosis of the ankle joint. This is an undesirable complication and was probably due to unwarranted trauma to the posterior

surface of the tibia. However, this is a splendid method of extra-articular fusion of the ankle joint and has been utilized by the author in other affections, such as tuberculosis.

In 4 children, the anterior block was employed to prevent excessive dorsiflexion or calcaneus. This was apparently effective in one case; in the other three, the calcaneus was corrected by the triple arthrodesis and backward displacement of the foot, but the block was ineffectual. The block is



FIG. 13. Roentgenogram of foot following midtarsal arthrodesis and drop-foot operation. The mass of bone is well placed and blocks gravity flexion, but is not united by bone to either the astragalus or the os calcis. Note grotesque proliferation.

not recommended in such conditions, though there are other recognized measures which are effective.

One negro child died of tetanus one week after operation. This boy had been barefoot for several months prior to operation and had a skin eruption of mild type, for which he was treated in bed for ten days before operation. Since this catastrophe, anti-tetanus serum is routinely administered in an immunizing dose prior to all operations on the feet of children who have been running about barefoot.

In 11 children, varus of the forefoot developed after operation, but in only a small number of these was the degree of



sufficient severity to warrant treatment. Slight varus is not incompatible with good functional result. In one, there was marked valgus, though a stable foot was obtained with an efficient block.

In estimating the postoperative progress by the roentgenogram, there are three chief factors to be considered: the bone block, arthrodesis of the tarsus and the position of the foot.

The bone-block, to meet all requirements, should follow the prescribed dicta: The osseous process should be well organized, of sufficient dimension, of close approximation to the posterior aspect of the ankle joint, and fused by bone to the posterior extremity of the astragalus and the superior surface of the os calcis. The efficacy of the bone-block can, in 95 per cent of cases, be determined by roentgen ray, but in a small number, plantar flexion may be limited by adhesions or scar tissue. Conversely, it has been found that a bone-block may be observed which meets all requirements from the standpoint of the roentgenogram and yet does not prevent plantar flexion. This may result from relaxation of the ligaments of the ankle joint, with failure of fusion in the tarsus, and is usually observed in individuals with congenital relaxation of joints who are affected with poliomyelitis. In this well-known relaxed type, end-results of all stabilization operations are less successful and recurrence of deformity is more common.

In the cases of 33 children, roentgenograms were made to determine the results. In 25 of these, the bone-block met all requirements of the prescribed dicta. Five met all requirements except one, but the block was efficient in preventing gravity flexion. In 1 of the 5, a large mass of bone was found posterior to the ankle, but not united to any adjacent bone. In 2, the block was entirely absorbed; in one, the block was too far back, though efficient; and, in one, the block was deficient in dimension.

In order to improve function in paralytic feet, stability is essential. In this series,

stability has been acquired by arthrodesing operations on the tarsus; a description of the procedure was outlined previously.

Unless osseous fusion is attained, the chances of permanent success are diminished and the degree of osseous fusion may be taken as an index of success. Fibrous union of the tarsal joints lessens endurance, with a more probable complication of pain from foot strain thereafter. However, an excellent functional result is not incompatible with a strong fibrous union.

Of the 33 children of whom roentgenograms were made, triple arthrodesis was employed in 21; in 2 of these, union was part fibrous and part bony; in 2 there was non-union or fibrous union. In 7, fusion was attempted in the midtarsal joints, astragaloscaphoid and calcaneocuboid. In 5 there was osseous fusion throughout; in 1 case the calcaneocuboid was fused by bone and the astragaloscaphoid by fibrous union. In 1 there was fibrous union of both joints. The roentgenogram will determine only the structure of the longitudinal arch. Of the 28, in 2 the arch was obliterated, there being extreme flat-foot, which could have been avoided by routine after-treatment, as above described. Unless varus is extensive, the roentgenogram is of little value as a determining factor.

Of 109 adults, the ages ranged from fifteen to sixty years, but a very large percentage were under thirty, and a very small number over forty. Eighty-six met all requirements and received careful personal observation, with notation. Of this number, there were 83 with efficient block, preventing gravity flexion, while 3 failed. The causes of failure in adults were the same as mentioned in reviewing the cases of children. The results in adults after six months may be regarded as definite and conclusive. In 8, the operation was bilateral and at different sittings; these are counted as two operations.

After operation, 5 developed varus, 2 of these to such a degree as to warrant a second operation. Two had marked planus. Pain persisted in the tarsus over one year



in 4, then gradually subsided. In 4, pain persisted in the heel, but in one did not abate at the end of one year. The roentgenogram of this case did not demonstrate excess bone, nor was there any apparent mechanical pressure. However, a portion of the bony process was excised with complete relief. The pain in the tarsus could not be ascribed to the bone-block operation, but must be regarded as a sequence of triple arthrodesis, as pain may be a persistent symptom after any reconstruction operation on the foot of an adult. In 1 case there was a fracture of the block, which gave pain for a few days, after which recovery was uneventful. This can be prevented if the process is not made too slender at the point.

Postoperative roentgenograms were made in 54 adults from six months to four years after operation. The bone-block conformed to all requirements in 42. In 9, the bone-block was efficient, but failed to unite at one point, either the posterior aspect of the astragalus or the os calcis. In 4 the bone-block was deficient. The triple arthrodesis was not necessary in so large a proportion of cases in adults, but was employed in 29, in 3 of whom the roentgenograms showed that bony fusion was doubtful. In 16 with arthrodesis of the midtarsal joints alone, 3 showed part bony fusion and part doubtful fusion, or probably fibrous fusion. Four showed fibrous fusion or nonunion. Taking the series as a whole, 43 showed osseous fusion, 3 partial osseous fusion, and 7 probable fibrous union.

In adults, the roentgenograms revealed 8 in whom the longitudinal arch was obliterated and the feet were flat. This, as in children, could have been avoided by the detailed routine after-treatment above described. By such observations, the routine after-treatment was evolved. Flat-foot as a result, while undesirable, may give excellent function, provided osseous fusion is firm.

The chances of permanent success without recurrence in all operations for paralytic

feet increase proportionately with the age of the patient, and this is true with the bone-block operation, as with the arthrodeses. However, if comparison is made between adults and children, it will be observed that in children the ratio of success to failure of the bone-block was 71 to 5, while in adults the ratio was 86 to 3. This, reduced to percentage would be in children 92.8, and in adults, 96.5.

The morphology and the mechanics of the bone-block have been the same in children as in adults. This offers a most instructive study in osteogenesis, with variations in structure which may be enumerated as follows:

1. The common type is an osseous process fused to the os calcis and astragalus, prolonged backward on the superior surface of the astragalus and extending upward at right angles posterior to the tibia, so as to block within the joint and also posterior thereto.

2. The posterior aspect of the astragalus is enlarged by the process, blocking within the joint.

3. A process attached to the upper surface of the os calcis, extending upward with the posterior surface of the os calcis, preventing plantar flexion by impinging upon the posterior surface of the tibia, being entirely extra-articular.

4. The posterior surface of the astragalus is enlarged and extended backward, but conforming to the anatomical shape of the posterior extremity of the astragalus.

5. Grotesque and marked proliferation of graft.

6. A longitudinal mass of bone, well placed and blocking gravity flexion, but not united by bone to either the astragalus or the os calcis.

7. The bone-block fused to the tibia, os calcis and astragalus.

Of 76 children, there were 11 in whom varus recurred or developed after arthrodesis of the midtarsus or triple fusions, while in adults only 5 of the 86 observed developed varus. It is quite obvious that the relative comparisons as to osseous

union between the bone-block and arthrodesis of the tarsal joints in adults and children are favorable to bone-block. Taking the entire number of children and adults examined, 162, there were 154 successful with efficient bone-block, only 8 having failed; or, approximately 96 per cent were successful.

The tables graphically demonstrate the comparative results between adults and children, from both the roentgenological and clinical manifestations:

The objections that have been made to this procedure have been only theoretical. The probability of pain from pressure has been suggested. From the 162 cases reviewed, this has been a symptom in only 4, none of whom were children. In only 1 case has there been persistent pain, which was relieved, as above stated. Pain is a symptom which has been persistent after any reconstruction operation on the foot, and as is demonstrated in this series, occurs with equal frequency in the midtarsus

ROENTGENOGRAPHIC DEMONSTRATION

	Total number	Bone-block efficient. Osseous fusion complete	Bone-block efficient. Osseous fusion partial	Bone-block deficient	Triple arthrodesis. Osseous fusion complete	Triple arthrodesis. Osseous fusion partial	Triple arthrodesis. Non-union	Mid-tarsal arthrodesis. Osseous fusion complete	Mid-tarsal arthrodesis. Osseous fusion partial	Mid-tarsal arthrodesis. Non-union	Position flat
Children.....	33	25	5	3	17	2	2	5	1	1	2
Adults.....	54	42	9	4	29	2	4	14	3	4	8
	87	67	14	7	46	4	6	19	4	5	10

CLINICAL RESULTS

	Total number	Conformed to requirements	Bone-block efficient	Bone-block deficient	Post-operative varus	Post-operative valgus	Pain in heel	Pain in tarsus	Fracture of graft
Children.....	104	76	71	5	11	2	0	0	0
Adults.....	109	86	83	3	5	8	4	4	1
	213	162	154	8	16	10	4	4	1

Estimation of the end-results of the combined procedures of the posterior block and arthrodesis, or other measures, can be reached only in a very general manner, as there are many factors to be considered. Nor are the notes definite on all points, though, roughly speaking, we may consider 80 per cent excellent and 15 per cent improved, with 5 per cent unimproved. There have been few complications; the usual slow healing and superficial sloughs have been found, as in all procedures on paralytic feet, but infections were rare and there were no serious results attributable to operation.

from arthrodesis, as in the heel from transplanted bone. The second objection is that arthritis might be developed by the bone-block being so near the joint. In answer to this, refutation can be made by the fact that, of the 162 cases reviewed, none has shown the slightest evidence of subsequent arthritis. This objection is based on the assumption that joints which have a bone-block following fracture often develop arthritis. In the first place, all such joints do not have arthritis, and in the second place, there is no analogy, as joints in fractures are usually severely traumatized, with reaction, as denoted by callus about or

within the joint. No real adverse reports have been made. In the bone-block operation, there is no occasion to traumatize the joint. It has also been stated that the operation is too radical, but the results herein reported, as well as those of others, completely refute such a statement.

Mr. Robert Ollerenshaw before the meeting of the British Orthopaedic Association, October, 1925<sup>1</sup> reported a series of 20 cases, of which he demonstrated the results in 8. He employed a bone graft in 2 cases which had a fractured tip. In my one case, no treatment was given. As stated previously, this can be averted if the process is not made too slender at the point.

In 1924, Dr. Dickson and Dr. Diveley, of Kansas City, reported 25 cases, with excellent results in all. Dr. Henderson and Dr. Meyerding, of the Mayo Clinic, reported a series of 8 in 1924, with excellent results. Dr. Leo Mayer, of New York, has also had a number of successful results from this operation. Others from various sections of the country have made individual reports of satisfactory results. In fact, it is quite apparent that the procedure has been of value in practically all paralytic deformities of the feet, with the exception of cavus, calcaneus and calcaneovalgus. The advantages of the operation are:

1. It has simplicity, as the transplants are usually available from associated procedures.

2. Apparatus may be discarded, as an internal brace is constructed.

3. Muscle power is conserved, by preventing the constant pull of the pendulous foot by gravity.

4. Constant prevention of overstretching may of itself induce a return of dormant muscle power.

5. As the functional demands are decreased, feeble power may be cultivated.

6. Rocker motion of the ankle joint is conserved.

7. Stabilization is rendered more effec-

tive by the bone-block and additional fusion of the astragalus and calcaneus through the block. The percentage of satisfactory and permanent end-results is thus materially increased.

### Discussion

DR. LEO MAYER: This is a beautiful piece of work. We have, I think, worked out successful methods for very badly paralyzed feet, so that we can assure our patients in advance that they are almost sure of getting good results. This is a very definite and radical advance which has occurred during the past ten years and is largely due to the work of Dr. Campbell in this field. I should like to ask him whether, where there are two strong peroneal tendons, best results are obtained not by bone-block operation but by tendon operation, in this case by transplanting the two peroneal tendons to the dorsum of the foot, the longus to the inner side, the brevis to the outer side. By this one will get a very excellent dorsal flexion. By combining this operation with an arthrodesis of the joint between the os calcis and the scaphoid, one secures a stable foot which has good dorsal motion and plantar flexion. Where the peroneal tendons are not present, the only way to get results is by well-constructed bone block. Instead of using a series of bone chips as in the typical Campbell operation, I have taken, one large graft from the anterior surface of the tibia, and have then inserted this graft into the upper surface of the os calcis. My impression from the study of my own roentgenograms is that this method is not as good as Dr. Campbell's. Although this method holds the foot in fair position, it does not suffice when it is standing against the pull of a rather strong Achilles tendon.

DR. SAMUEL KLEINBERG: I am not quite clear as to what to include in the type of cases in which Dr. Campbell performs this operation. I should like to know whether he advises this procedure where there is a calcaneous condition. I should like to know whether it can be used in a trauma, an equinus, varus or valgus, or a combination of all. If there is as much valgus or varus deformity as there is equinus, then why is not the Hoke's operation preferable? I would ask Dr. Campbell in using bone chips to establish the block is it necessary to remove cartilage from the bone that is used?

<sup>1</sup> Ollerenshaw, R. Surgical treatment of tangle-foot. *Brit. Med. J.*, 1926, i, 525.

I can see clearly where in a number of cases of equinus we were somewhat at sea as to what to do, I know now that we should have used the bone-block operation. In the future I shall be very enthusiastic about it.

DR. ROBERT HUMPHRIES: I think I am the only one here who has done this bone-block operation, and have seen a number of cases followed with very good results. There is no pain and it has held up the foot very satisfactorily for periods of two or three years after I have used it. I have had no such proofs as Dr. Campbell, but my own observations have been very satisfactory.

DR. CAMPBELL (closing): I thank you for your liberal discussion particularly at this late hour. I shall not go into details because of it, but in answer to Dr. Mayer, I feel that in connection with transplanting of tendons, wherever you use a tendon to lift up the foot, you may get very excellent results that may be permanent in many cases, but we have seen a number of cases which acted beautifully for one or two years or for quite a while, but ten years later, after constantly bearing weight and being used, the muscle became stretched, because that is more than any transplanted muscle can really accomplish. The bone-block operation forms a permanent bony process with limited plantar flexion. It is not necessary to have full plantar flexion in this case. In answer to Dr. Kleinberg, in a case of equinus, I lengthen the heel cord where it is tight, and if it is rigid, I do it at the same time as I make the bone-block. I always lengthen where there is the slightest contracture of tendon. As to calcaneus I tried the operation in five or six cases and found it an absolute failure. You ask about other deformities of the foot. Whenever I have to deal with an equinus, whether valgus or varus, I use bone-block. If bone is excised from the forefoot it is denuded of cartilage, and this removed cartilage is placed in mosaic fashion to cover the posterior, inner and outer aspects of the pyramid to prevent adhesion to the surrounding structures. You can pull it off with a knife, or you can shave it off. This step, however, is by no means essential, as results are as good when bone is obtained from elsewhere free of cartilage. Regarding the question of pain, should pain persist, we could remove a portion of the new process. I have had to do it in but one case out of the 162 that have been mentioned here.

## PRESENTATION OF CASES

### RECURRENT DISLOCATION OF THE PATELLA. OPERATION

SAMUEL A. JAHSS, M.D.

(By invitation)

This girl, aged sixteen, came to the Hospital for Joint Diseases in August, 1926. In June, 1926, while running, she felt something snap in her right knee. She could not bend her knee although the entire phenomenon was not accompanied by much pain. She saw that the right knee was much broader than the left, and she also noticed something sticking out on the side of the joint (external). She straightened her knee, and this protrusion snapped back into place, without manipulation. This occurred two or three times a week for about eight weeks. (June to August.)

She was operated upon August 18, 1926, by the Albee modification of the Jones operation in which the trochlear surface of the external condyle was osteotomized and a triangular bone graft (from the tibia) was inserted into the space between the fragments of the condyle in order to raise the trochlear surface and prevent dislocation from taking place. This procedure is recommended in cases where the external condyle is much flatter than the internal one, a condition present in the congenital type of case. Although the transposition of part or the whole of the ligamentum patellae is advised (A. G. T. Fisher) in cases that are not congenital (in which group the present case belonged), this procedure was not followed because recurrences are reported quite often when the soft structure operation alone is performed. The result has been most satisfactory. The patient has a normal range of motion and has had no recurrence since the operation, a period of seven months.

### BILATERAL COXA VARA OF UNKNOWN ORIGIN

JOSEPH G. WISNER, M.D.

(By invitation)

N. D., aged seven years, was admitted to the Hospital for Joint Diseases in May, 1926, on the service of Dr. Leo Mayer. She had been sent there by the school doctor who, in the routine examination when the child first entered school, discovered peculiarity in walk-

ing and limitation of motion at the hips. She is the seventh child of her mother, and was delivered at term as a normal head presentation without any difficulty. She weighed ten pounds at birth. During her infancy she was breast-fed and bottle-fed. The first tooth appeared at seven months. She began to walk at eight months. She talked when one year old. There was at no time during her infancy any sign or symptom of rickets. There were none of the acute infectious diseases of childhood until the age of three, when she had a mild pertussis, and at six when she had varicella. The mother states

degrees, and there was flexion contracture of 15 degrees at both hips. All other motion at the hip was normal. Wassermann reaction negative. Although our first impression was that the condition was one of congenital dislocation of the hips, limitation of abduction and flexion contracture established the diagnosis of bilateral coxa vara.

The roentgenogram (Fig. 1) shows coxa vara with peculiar disturbance at both upper femoral epiphyses. There is an interruption in the continuity of the neck, but the periosteum at the lower border is still intact. The etiology is

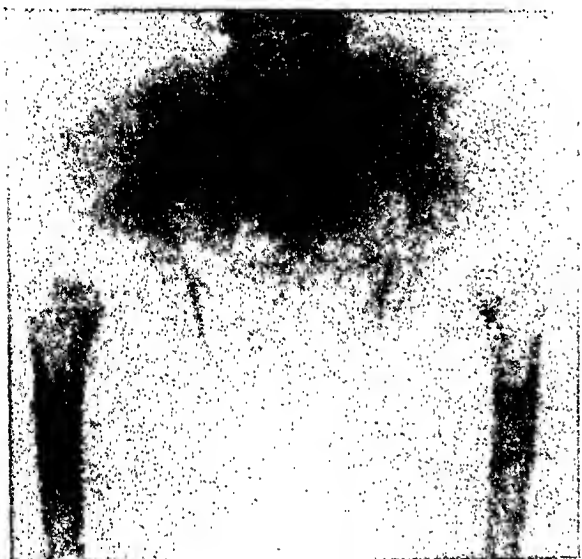


FIG. 1. Bilateral coxa vara due to giving-way of neck. Loss of continuity except at lower border.

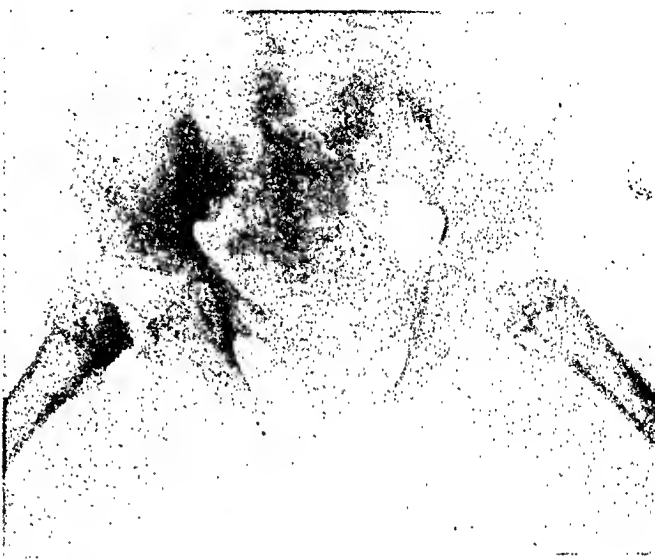


FIG. 2. Bilateral wedge osteotomy through greater trochanter correcting coxa vara.

that the baby walked normally, that is like all other children, until she was three years old. During this time she fell frequently but not severely. The mother attributed the frequent falling to lack of proper attention and not to any illness or abnormality. At no time was the child laid up or disabled. When three years old there began peculiarity in walking, and at that time the mother recalls the baby did complain of occasional fatigue. Still no medical aid was sought because the parents thought the gait only slightly abnormal, and hoped it would improve with time. When the child entered school at the age of six the school physician discovered the real state of affairs.

Examination on admission showed a marked lordosis with the waddling gait so characteristic of bilateral congenital hip dislocation. Both trochanters were high but on the same level. The lower extremities were of equal length. Abduction of both legs was limited at five

not quite clear. This case corresponds very closely with several described by R. G. Elmslie as idiopathic coxa vara of the infantile type, with fibrous intersection at the neck. In his cases, the onset was likewise insidious, the age was between three and six, and all had lordosis and flexion contracture at the hips. The roentgen-ray pictures were exact replicas of the one in this case. Mr. Elmslie, however, after considerable pathological and anatomical work could not arrive at a definite causative factor. He suspected a maldevelopment in the upper epiphysis of the femur with weight-bearing as the deciding factor. In our case, there was no trauma at birth and rickets was ruled out. It is possible that the frequently repeated injuries during the first three years were sufficient to cause this downward displacement of the head and neck, a weak or undeveloped neck being a predisposing factor. After this, the body weight was sufficient to cause further

downward displacement of the head and neck. Since bone development begins and proceeds from the lower part of the neck, here the periosteum and a thin layer of bone may remain intact. This type is to be differentiated from the congenital type of coxa vara which is evident as soon as the child begins to walk. In these cases there is no abnormality in the development of the neck of the femur. In the infantile type, the so-called fibrous intersection of the neck has been demonstrated by R. Jones and Elmslie, and the specimens they have show the presence of other congenital abnormalities. In rickets, the roentgenogram is entirely different. There is a bowing of the whole neck along with an antero-external bowing of the upper end of the femur. Also in these cases there is usually no limitation of motion at the hip.

Treatment consisted in cuneiform osteotomies through the greater trochanter and correction of the flexion contracture at the hips (Fig. 2). The child can now abduct to 45 degrees. The lordosis is only partially corrected but is now being treated with exercises. There has been an increase of one-half inch in the length of both lower extremities. The height of the child has increased three-quarters of an inch. Her general appearance is suspicious of a thyroid or multiple endocrine gland disturbance. For this reason, we have prescribed thyroid extract,  $\frac{1}{2}$ , three times a day for the past eight months. Whether the endocrine disturbance is a factor in this case I cannot say. Roentgenograms of other joints and long bones show nothing abnormal.

## BIFURCATION OPERATION

### (THREE CASES)

WALTER I. GALLAND, M.D.

CASE 1. M. S., aged eleven years. Infectious epiphysitis at the head of the right femur at the age of three years completely destroying the head and neck of the femur. Admitted to the Hospital for Joint Diseases September 18, 1925. Chief complaint, limp and shortening of the right lower extremity. On admission had a severe right hip limp. This hip was in 30 degrees of flexion contracture. There was a shortening of  $2\frac{1}{2}$  inches of the right lower extremity which was extremely atrophic, a "match-stick leg" due to disease. On September 14, 1925, a Soutter fasciotomy was

performed, and the flexion contracture was corrected. The child was then placed in suspension-traction and the shortening was reduced about  $\frac{3}{4}$  of an inch. On April 1, 1925, the bifurcation operation was performed through a five-inch incision beginning at the tip of the greater trochanter, and extending down the antero-lateral aspect of the thigh. The femur was exposed and divided obliquely with an osteotome at the level of the lesser trochanter. The upper end of the lower fragment was dislocated into the acetabular region by abducting the extremity and guiding the fragment into position with the forefinger. The trochanteric fragment was adducted by digital pressure. The extremity was placed in a plaster spica to the toes with the hip in 10 degrees of flexion and slight external rotation and 40 degrees of abduction. There was no postoperative shock. Weight-bearing was permitted in plaster after four weeks. The spica was shortened to the knee after six weeks, and removal 11 weeks after the operation. The hip now functions painlessly. There is 1 inch of shortening; flexion is free to 90 degrees, abduction to 40 degrees. Rotation is moderately free.

CASE 11. Mrs. A. M., aged fifty-four years. Admitted to the Hospital for Joint Diseases, October 12, 1926. Chief complaint, pain in left hip. The left lower extremity was held in external rotation. The extremity showed an actual shortening of  $1\frac{1}{2}$  inches. Flexion was limited to 15 degrees on account of pain, abduction limited to 30 degrees. The greater trochanter was elevated above Nélaton's line. Sliding motion of the femur was present. Roentgenogram showed ununited fracture of the neck of the left femur. The patient was placed in preliminary suspension-traction, and the shortening was somewhat reduced. She was in poor physical condition on admission and was not considered a good operative risk. A large mass was present in the right iliac region—a polycystic kidney.

Operation, November 4, 1926: The left femur was bifurcated through a six inch incision beginning at the tip of the great trochanter as in Case 1. The osteotome was directed upward and inward into the lesser trochanter from a point four fingers below the tip of the greater trochanter. The upper end of the lower fragment was dislocated and guided with the forefinger into position just below the "chin" of the head of the femur. The trochanteric



fragment was adducted by digital pressure. Plaster spica applied to the toes, with the hip flexed 10 degrees, abducted 40 degrees, and the thigh in slight external rotation. Patient bore weight in the spica twenty-three days after operation. Spica shortened to knee six weeks after operation, and removed three months after operation. Patient has had no pain since operation, flexes thigh 10 degrees past right angle. Abducts to 35 degrees. Rotation moderately free. Shortening 1 inch.?

CASE III. Mrs. R. A., aged forty-six years. Chief complaint, pain in left hip. Has had a painful osteoarthritis of the left hip for the past nineteen years, and has been treated in many institutions without relief. Roentgenogram shows marginal dislocation of the head of the femur due to wandering of the acetabulum. The hip was so painful that she could not walk across the room. Had a severe limp. In this case, the bifurcation was done for the relief of the pain rather than for any cosmetic purpose. By bifurcating the femur in this case the osteoarthritic head is relieved from weight-bearing, and simply becomes a part of the trochanteric muscle lever fragment. The body weight is borne on the diaphysial or distal fragment. Operation May 13, 1926. Bifurcation of the left femur by the same technique as in Case II, the proximal end of the lower fragment being guided into position just below the chin of the head. Plaster spica including the toes. The patient was discharged from the hospital July 8, 1926, and disappeared from observation until March 18, 1927, when she came to the out-patient department walking without pain and with a slight hip limp, extremely grateful for the relief obtained. Flexion of the hip to 10 degrees past right angle, abduction unlimited, rotation free, no pain.

### STENOSING TENOVAGINITIS

DR. H. C. STEIN, M.D.

(By invitation)

There is a very painful and disabling condition about the wrist, which is encountered rather frequently, and although described many years ago has not been described in American literature. There is no reference to it in our textbooks or medical journals. We were able to find six references in foreign literature. It was first described by de Quervain in 1895 in *Correspondenzblatt für Schweizer Aerzte*. He

reported at that time two cases that he operated upon, and three nonoperative. Wetti in 1896 described one operative case. Marion of Paris in 1903 described six nonoperative cases. Poulsen of Copenhagen in 1911 described ten nonoperative cases. Michaelis in 1912 described one operative and two nonoperative cases. De Quervain in 1912 added eight operative cases to his previous report. Thus, there are reports of only twelve operative and twenty-one nonoperative cases in the literature.

This condition occurs in the first compartment of the posterior annular ligament through which the tendons of the extensor brevis pollicis and abductor longus pollicis pass. Cases of this kind are not very amenable to conservative treatment. The symptoms resulting are out of proportion to the extent of the lesion. We had a number of these cases several years ago in which we tried various forms of conservative treatment such as diathermy, forcible abduction, casts, etc., without much success. This condition is readily cured by a simple operative procedure. Recently, we operated on four such cases at the Hospital for Joint Diseases.

As a tendon passes around a curve it passes through a fascial pulley, which in this condition is the first compartment of the posterior annular ligament. In order that there should not be too much friction against this pulley a tendon sheath filled with synovial fluid exists which extends above and below this pulley. (The mechanism of this sheath has been described by Dr. Leo Mayer.) Normally, this pulley, which is called the tendon fascia, is thin and elastic and with the fluid in the tendon sheath permits the tendon to glide back and forth without resistance. An 18F or 20F sound can be passed through alongside the tendons. In this condition the tendon fascia undergoes changes similar to those in Dupuytren's contracture of the palmar fascia. In a well-developed case the tendon becomes markedly constricted and compressed by this tense fascia, reducing its caliber often-times to one-quarter its original size. It is constricted both laterally and anteroposteriorly. The tendon fascia is very much thickened and inelastic, very dense and does not even permit the passage of a fine probe without much force. The constricted tendon is frayed, loses its luster, and is sometimes covered with a fine granulating tissue or gritty substance. Immediately distal to this constriction a bulbous enlargement of the tendon exists extending

downwards one-quarter to one-half inch. Microscopical examination of sections of strangulating fascia showed various stages of inflammatory reaction. In the acute and earlier cases hemorrhage and numerous young fibroblasts studded by round cells of fibrin production were found. In the more advanced cases cartilaginous and calcareous changes were found.

The subjective symptom is very severe pain radiating from the region of the radial styloid down the thumb and up to the elbow, and in one case up to the shoulder. Pain is aggravated on grasping objects, and is often so severe as to cause the patient to drop the object he is holding. During the night, pain is often so acute as to cause loss of sleep, and relief is obtained by resting the arm in a fixed position on a pillow. On examination in most cases there is little to be found except severe tenderness over the region of the radial styloid. Occasionally, a little edema of the annular ligament is present. Bulbous enlargement distal to the ligament can frequently be felt. Forced ulnar flexion of the wrist causes severe pain.

The first compartment is not the only place where this lesion occurs. We have had exactly the same condition occurring in the fifth compartment through which the extensor carpi ulnaris passes; and this case was diagnosed before operation by the analogous symptoms on the ulnar side. As far as I know, it is the first case of this nature ever reported.

This condition is usually incorrectly diagnosed, being most commonly mistaken for periostitis of the radial styloid, although roentgen-ray examination in all cases is negative. Some are treated for rheumatism, neuralgia, etc.

Surgical treatment consists in freeing the bound tendon either by dividing the stenosing fascia by a simple incision, or by removing a section from the external wall of the compartment or by extirpating the entire fascia. Subcutaneous division has been reported with successful results.

CASE I. S. L., aged forty years, painter, had the condition for four months: severe pain radiating the elbow, extreme tenderness at the tip of the radial styloid, forcible ulnar flexion of the hand painful. Could not work. Operation. Cure.

CASE II. E. B., aged thirty-six years, houseworker. Complained of severe pain in the left wrist for six months, radiating down to the thumb and up to the shoulder. Attributed her

condition to wringing clothes. Prior to operation could not sleep and could not do her work. Operation eight months ago: external fascial wall excised. Complete cure.

CASE III. L. W., aged twenty-four years, houseworker. For three months prior to operation had severe pain in the right wrist extending down to the thumb and up to the elbow. Operation six months ago: fascial wall excised. Complete cure.

CASE IV. J. C., houseworker. Pain over the left radial styloid radiating to thumb and elbow. Attributes her condition to fall on the tip of her left thumb. Could not do her housework. Had to keep her wrist supported by pillows at night. Operation two months ago with local anesthesia. The instant the stenosing fascia was incised patient remarked that she felt everything went back in place and her arm felt fine. Has had no pain or other symptom.

CASE V. E. N. Attributes her condition to a fall. Had symptoms for three years preceding the operation; very severe pain over the ulnar styloid. Extreme tenderness was found over the tip of the ulnar styloid in the region of the fifth compartment. Slight edema in this region. A diagnosis of stenosing tendovaginitis of the extensor carpi ulnaris was confirmed at operation two months ago. Fascial wall excised. Complete cure.

In conclusion I would like to emphasize that in all cases of acute tenderness of the radial styloid with negative roentgen-ray findings a diagnosis of stenosing tendovaginitis is to be considered.

I wish to thank Dr. Harry Finkelstein and Dr. Henry L. Jaffe for assistance and suggestions in the study of these cases.

#### WHITMAN RECONSTRUCTION OPERATION FOR UNUNITED FRACTURE OF THE HIP

ISADORE ZADEK, M.D.

A girl, sixteen years old, was admitted to the Hospital for Joint Diseases in July, 1926, with the complaint of pain and disability affecting the lower right extremity and to a less extent the left. Four weeks prior to this, the patient slipped but did not fall, and was not completely disabled at any time. Further questioning disclosed the fact that she had never been quite so active as other children of her age. Examination showed a girl in good condi-



tion but of small stature, who walked with a marked bilateral limp, more marked on the right than on the left side. There was exaggeration of the lumbar lordosis, the right hip in 15 degrees adduction and flexed to 120 degrees. The greater trochanter on this side was elevated and prominent. There was moderate sensitiveness over the front of the hip joint. No abduction was permitted. There was apparent shortening of an inch and a quarter, and a measured shortening from the anterior superior spine of the ilium to the internal malleolus of a quarter of an inch. No abduction was permitted on the right but flexion was permitted to 90 degrees on both sides. Left hip: Abduction was permitted to 15 degrees and flexion likewise permitted to a right angle. A roentgenogram at this time showed a bilateral coxa vara with the greater trochanters pointed and curved—of the "beak" type. There was ununited fracture of the right femur with absorption of practically all of the neck and upward displacement of the shaft. A few days after admission to the hospital the typical Whitman reconstruction operation was done, the head fragment being removed and the remodeled neck placed in the acetabulum, the greater trochanter being displaced to a lower level. The articular cartilage was absent from a considerable portion of the head of the femur, and its surface contour was irregular. A plaster of Paris spica was applied with the hip in 25 degrees abduction. The subsequent course was uneventful. Examination at the present time discloses the hip in 15 degrees abduction and flexion to 160 degrees. There is not more than 10 degrees movement in any direction permitted. The patient is satisfied with the result; she states that she has complete relief from pain and is able to walk twice as far as she could prior to examination.

While I have had no elaborate experience with the reconstruction operation, the cases that I have seen have shown a distinct tendency to have the adduction recur, and while some of the patients get a fair amount of movement it would seem that limitation of movement is to be expected and that the end-result is a fibrous ankylosis. One would expect the hip to go into adduction again because the remodeled neck fragment is so short. It seems hardly reasonable to expect that a transplantation of the muscular attachments with the greater trochanter to a level a couple of inches lower would have any great influence in pre-

venting adduction when we have the long opposing adductors inserting at a lower level.

## DELAYED ULNAR PALSY. OPERATION

HARRY FINKELSTEIN, M.D.

I. A., aged thirty-seven years, was admitted to the Hospital for Joint Diseases February 7, 1927. He fractured his right elbow six and one-half years ago. He was treated for nine weeks at the Lincoln Hospital, then at the Hospital for Joint Diseases, for several weeks; received baking, massage and manipulation. The elbow remained partly stiff. Flexion was possible to about 100 degrees, extension to 120 degrees. Pronation and supination were unimpaired. Last January he began to complain of hyperesthesia, numbness and loss of power in the little and ring fingers. The left wrist is somewhat restricted in motion: flexion 30 degrees, extension 20 degrees, only a slight amount of lateral mobility. Little and ring fingers held in semiflexion; unable to fully extend them voluntarily. Neurological examination revealed presence of an ulnar neuritis. Operation advised. Roentgenograms on February 14, 1926, showed osteoarthritic changes, and the appearance of an old fracture of the extreme tip of the olecranon process.

Operation, February 10, 1927: Incision over ulnar nerve. Considerable bleeding due to congested tissues. Nerve found bound down with dense adhesions. These were incised, the nerve was removed from its normal situation behind the internal condyle and surrounded by a layer of fat forming a tubular canal. The nerve was then returned to its former position. February 11, 1927, patient "feels life" in both fingers. February 19, 1927, discharged, moving fingers normally, and with sensation returned. The amount of motion in the elbow has increased, although no effort was made to overcome the bony obstruction. The only explanation for this increased motion is the relief of muscular spasm.

The literature contains about one hundred recorded cases of ulnar paralysis occurring from one to forty years following injury to the elbow. The description of the various contributors corresponds in many details. The primary cause is a fracture at the elbow, years prior to the onset of the paralysis. The site of injury

may be the internal condyle, the supracondylar region or, more often, the external condyle. The fractured area may not be accurately reduced, cubitus valgus resulting as a rule. This deformity causes impingement against the inner condyle, the ulnar groove becomes shallowed and the nerve may be displaced or stretched or irritated on flexion or extension of the elbow. This in time leads to partial or complete ulnar palsy.

## OSTEOCHONDRITIS OF THE SPINE

HARRY FINKELSTEIN, M.D.

W. H., aged eight and a half years, was admitted to the Hospital for Joint Diseases October 30, 1925. History of a fall six weeks previous from a fence two feet high. No night cries, no loss of appetite or weight. Mother noticed that child walked peculiarly with the back stiff, and that there was a lump over the middle of the spine. Examination showed a slight kyphosis in the region of the eighth dorsal vertebra, some rigidity on flexion and hyperextension. No pain or tenderness, no abdominal masses, no paraplegia. Roentgen-ray examinations November 4, 1925 and February 11, 1926. The body of the eighth dorsal vertebra is compressed and represented by a small sclerosed fragment of bone. The intervertebral spaces above and below are increased in width. von Pirquet and Wassermann reactions negative. Treatment: The child was kept on a Bradford frame up to the time of the operation, which was on February 8, 1926. Bone graft was inserted into the spine from the sixth to the twelfth dorsal vertebrae. Roentgen-ray examination June 6, 1926, showed bone graft in place. April 23, 1926, patient out of bed wearing a plaster cast. May 23, 1926, cast removed. July 1, 1926, referred to Country Branch at Far Rockaway. Motion is free in all directions, no pain or tenderness, no muscular spasm, general condition good.

This condition was first described by Calvé of Berck, France, in September, 1924.<sup>1</sup> His description, covering one case of his own and one exactly similar of Braekett of Boston, is as follows: The lesion attacks only one vertebra, whereas Pott's disease attacks at least two vertebrae. In striking contrast to tuberculosis, there is an absolutely intact condition of the discs above and below the diseased vertebra.

<sup>1</sup> A localized affection of the spine suggesting osteochondritis of the vertebral body, with clinical aspects of Pott's disease. *J. Bone & Joint Surg.*, 1924, vii, 41-46.

The cartilage is thicker and there is a neoformation of this tissue. The transparent part above and below the lamellar osseous nucleus is at least one-third higher than normal. This is never seen in tuberculosis, which is markedly destructive of cartilage tissue. Greater opacity is to be observed, which indicates that bone density has increased. This condition on roentgen-ray examination and clinically resembles cases of coxa plana, Legg-Calvé's disease, infantile osteochondritis of the hip, and Koehler's disease. The result of treatment was excellent in both cases in a comparatively short time. Buchman<sup>2</sup> has added two cases, and refers to a case cited by Gallie; Buchman's description differs considerably from that of Calvé. His first case showed an involvement of eight dorsal vertebrae, while the second case showed an involvement of two vertebrae, the twelfth dorsal and the first lumbar. He explains the differences between his cases and those of Calvé by referring to other forms of osteochondritis, in which there are first irregular, moth-eaten, mottled porous appearances of the affected area, to be followed by the stage of regression when calcification processes set in to form the dense, sclerosed-appearing outlines.

## OBLIQUE TRACTION FOR COMPENSATION IN SCOLIOSIS

LANTERN SLIDE DEMONSTRATION

DAVID R. TELSON, M.D.

(By invitation)

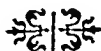
At the last meeting of the American Orthopedic Association in Atlanta, Dr. Arthur Steindler of Iowa read a paper on the Compensatory Treatment of Idiopathic Scoliosis. His feeling was that the curvature of scoliosis is healed in the same manner that any other spinal deformity is healed, namely by the elimination of motion in the deformed part. He felt that any method which attempted to attack major curvature by opening the segments of the spine by means of traction or exercise or plaster jackets was a method defeating its own purpose, and that the ultimate end-result was attained by either operative fusion or a natural fusion. He therefore stated that it would be wiser to allow the major curve to remain in the position one found it, and attempt to produce a compensatory curve

<sup>2</sup> Buchman, J. Osteochondritis of vertebral body. *Ibid.*, January, 1927, ix, 55-66.

either above or below, or both above and below, which would cause a state of equilibrium. I felt with Dr. Steindler that it was useless to attack the primary curve if a translatory shift of the shoulders was allowed to remain. If, however, as we see in this first case, there is a right dorsal curve with a shift of the shoulders a considerable distance to the right, any attempt to straighten out the curve would result in still further right translatory movement of the shoulders. While Dr. Steindler in his effort to secure compensation by means of the formation of a lumbar curve in the opposite direction of the translatory curve has used exercise, I have devised the method of oblique traction to attain the same result in what I feel is a more efficient manner. The result on this first case after three weeks of oblique traction is shown. (First lantern slide.) I have disregarded Dr. Steindler's dictum, and attempted to straighten the major curve, but the main accomplishment I feel has been formation of the secondary lumbar and cervical curves, allowing the shoulders to be placed directly over the pelvis. Notice also, however, that the major curve is considerably straightened as is shown by the added number of vertebrae pictured on roentgenogram of the same size. The next slide is one taken after six months, during which time the child has been wearing a plaster spica for six weeks, and for the rest of the period has been in a special brace. The next slide demonstrates an oblique traction bed. One observes that there is a right dorsal curve with a right shift of the shoulders, also that the left hip was considerably higher than the right. I shall therefore fix the Sayre halter to the head of the bed and

establishing a fulcrum at about the eleventh dorsal vertebra, by means of left lateral traction of 20 lbs. will swing both lower extremities to the extreme right side of the bed. I shall then add 15 lbs. traction on the left leg and 15 lbs. on the left side of the pelvis by means of a pelvic band. I shall add but 10 lbs. on the right leg and 10 lbs. on the right side of the pelvis, thus causing both a swing of the pelvis to the right with the fulcrum in the lower dorsal region and a leveling up of the two anterosuperior spines by means of adjustment of the lumbosacral junction. The child was kept in the traction bed for a period of approximately three weeks or until no increase in correction was obtained. I then applied a plaster of Paris spica with the child in Sayre suspension. In doing this, the right buttock was jacked up and the left thigh was included in the spica. In the future I shall apply this jacket by means of the Hibbs' traction frame, which I think is more effective than the Sayre suspension. The full correction of the shift of the shoulders is of course maintained while the spica jacket is being applied. At the end of six weeks, a special quadrilateral brace with thigh extension is ready and is substituted for the spica, and exercises are begun.

While the obliteration of the lateral shift of the shoulders should not be the only consideration in the treatment by any means, it is a major factor that has been very much overlooked in the treatment of this most baffling of deformities. Any treatment that does not include this correction will result in a straighter but a more oblique leaning tower of Pisa, and an invitation to further deformity will constantly exist.



## SUTURE OF DIVIDED NERVES OF THE HAND

ONE of the most important contributions to surgery during recent months, it seems to us, is the paper on "Surgery of the Nerves of the Hand" by Sterling Bunnell of San Francisco, which was presented before the last Clinical Congress of the American College of Surgeons and appeared in *Surgery, Gynecology and Obstetrics*, February, 1927. Certainly, it is a very valuable, practical and original contribution to the reconstructive surgery of the hand and from one who had already greatly advanced that particular sphere of endeavor.

Nerves in the hand and fingers are sometimes divided surgically by incisions made for the relief of infections. Still more often they are cut by glass, knives or machinery. Injury to a small motor nerve in the hand, or anesthesia in a finger, especially of the thumb, index or middle finger, constitutes a real disability, especially to the artisan who works with small tools. And yet, probably because these nerves are so small, surgeons generally have made no effort to repair them. They probably underestimated the sacrifice of function, and assumed that suture of so minute a structure would not yield results commensurate with the difficulty of the task.

It is quite startling, therefore, to learn from Bunnell that "Of all nerve sutures throughout the body those that are the most uniformly, promptly and completely successful are of the hands and fingers." He says "After repairing one hundred and five

nerves of the hand and fingers, largely in the course of operations on the tendons, the fact has been impressed upon me that if the ends of these nerves are accurately approximated, very good regeneration always follows. Although it is risky to use the word 'always' in surgery, in this instance it seems fully justifiable." He attributes these uniformly good results to two factors: first, that the nerves are no longer mixed but are purely motor or purely sensory; second, that the regenerative power of the nerves increases as the periphery is approached.

In six of his cases with defects in nerves of the hand too extensive to approximate the ends, Bunnell inserted grafts (some of them six inches long) from the sural nerve and secured "in every case sensation to light touch and pin prick and even some degree of stereognosis in almost the usual time and degree as after a simple nerve suture." He found that after suture of a volar digital nerve sensation was restored as a rule at the rate of a finger segment a month.

For the suturing of digital nerves Bunnell uses a No. 16 straight Kirby needle and the finest of silk thread, or even a single strand untwisted therefrom. For each nerve two guide sutures and four others are inserted, all through the sheath only. This is delicate work, to be sure, but it is quite within the technical capabilities of most trained surgeons. Bunnell has opened to the profession a field of surgical effort hitherto quite neglected.—W. M. B.



## ⦿ FREDERICK WILLIAM PARHAM ⦿

**D**R. FREDERICK W. PARHAM, who died on May sixth, was born in New Orleans, March 20, 1856, the son of John Greenway Parham and Mary E. Blunt. He was a graduate of the Randolph Macon College of Virginia and received his medical education at the University of Louisiana, now Tulane University. He did postgraduate work in Philadelphia and in European clinics, where he studied under

Surgeon of the Charity Hospital from 1885 to 1887, and one of his brilliant accomplishments was the inauguration and execution of a system of antiseptic and aseptic methods, which practically eliminated the fearful mortality caused by puerperal fever in the maternity wards.

He recognized the great lessons of Pasteur and of Lister, and when the means were not available for carrying out the



Frederick W. Parham (1856-1927).

Czerny, Bramann, Hahn, Ewald, and others. In 1877 he was admitted, by competitive examination, to the Charity Hospital, where he served as Interne for two years during which occurred the malignant epidemic of yellow fever of 1878. From that time until his death his interest in the Charity Hospital never faltered and whenever he felt it necessary he worked untiringly for the betterment of its administration.

Dr. Parham was Assistant House

teachings of these men he installed in his ward at Charity Hospital his own sterilizer and carried out in the same wards aseptic operations. It was through these demonstrations that he convinced the staff of the value of such aseptic procedure. It is hard to realize today, that it ever required the efforts of great leaders to prove to the community the worth of such teachings.

Other pioneer work of this great surgeon was in chest surgery. He was one of the first in this country to attempt extensive

work in malignant growths of the thoracic wall.

Dr. Parham was very active in organized medicine, having been President of the Southern Surgical and Gynecological Association, Vice President of the American Surgical Association, President of the Louisiana State Medical Association, and President of the Orleans Parish Medical Society. One recent achievement of his was the organization of the Visiting Staff of the Charity Hospital of Louisiana, which he accomplished almost single-handed. He served as President of the staff for one year. He was a Fellow of the International Surgical Society, of the American Surgical Association, and of the American College of Surgeons, and was a Regent of the College from 1920 to 1925. He was a Major in the Reserve Corps of the United States Army and served as Chairman of the Medical Advisors of the Draft Board during the World War. Up to the time of his death he was Chief of one of the two surgical divisions of Touro Infirmary and Consulting Surgeon on the Staff of Charity Hospital. Dr. Parham was Dean of the first school for training nurses established in New Orleans.

Dr. Parham contributed many original essays, observations and devices which have enriched surgical literature and won for him international reputation. Among many notable contributions may be mentioned articles on "Resection of the Thoracic Wall for Tumor," "Vesico-Intestinal Fistulae," "Operations for Inaccessible Vesico-Vaginal Fistulae," "Treatment of Hypospadias," "Head Injuries Marked by Intracranial Tension," "Some Practical Problems in Intestinal Obstruction." He is internationally known for his original work in the surgery of bones, one of his latest contributions to this field being the Parham and Martin band devised for the treatment of oblique fractures of bone.

As Professor of General and Abdominal Surgery in the Post-graduate School of Tulane University he was a recognized authority on surgery. It was to this

University that he devoted much time and thought having served as a member of the Board of Administrators from 1906 to 1914 and from 1925 until his death. His many years of service as Chairman of the Medical Advisory Committee of the Board stand preeminently as a model of conscientious and intelligent devotion to the highest interests of the School of Medicine and to the University. During his tenure of office many of the great reforms which have characterized the history of the School of Medicine in later years were first effected.

Recognizing his "services and achievements as a great and learned surgeon, as a medical leader, educator, administrator and public-spirited and self-sacrificing citizen, and more particularly the example set by his personal character, his absolute honesty, his conscientiousness in the discharge of his professional and public duties, his moral courage and his unapproachable integrity," Tulane University of Louisiana conferred upon him the degree of Doctor of Laws in June, 1925.

He loved science, as in science could be found the relief of human suffering, and he directed his best efforts to the study of methods for its alleviation. In reviewing his life one is reminded of one of his addresses in which the following lines occur: "For love is the thing that makes you care for the fate of this great round world. Everything that exalts life, makes possible unselfish devotion, inspires to great heroism and wins the utmost triumphs of art, has love as its root. 'He loved his fellow men' is the greatest enconium that one could wish at the end of a long life." He was jealous of the good name of his profession. When he detected anything that challenged that good name, or the integrity of a fellow physician, he would combat it with boldness and with a vigor that derived its force from an impregnable rectitude. The entire life of this great surgeon was "to strive, to seek, to find, and not to yield."

MUIR BRADBURN, New Orleans.

## ⊕ JOHN GOODRICH CLARK ⊕

**J**OHN G. CLARK was born in Wayne County, Indiana, June 4, 1867 and died May 4, 1927 of cerebral hemorrhage at the age of fifty-nine.

He was educated at Earlham College and Ohio Wesleyan University. In 1888 he entered the Medical Department of the University of Pennsylvania wherefrom

vanian and occupied this chair until he resigned shortly before his death. Here he developed one of the outstanding gynecological clinics in America.

Dr. Clark was a fluent speaker, a keen thinker, a facile artist, a finished clay modeler—all of which gave him an unusual advantage in conveying the idea of



John Goodrich Clark (1867-1927).

he was graduated in 1891. Post-graduate study was continued at Johns Hopkins University and at the Universities of Leipzig and Prague.

At Johns Hopkins he first showed his great ability as a teacher and a clinician. While associated with Dr. Kelly he did his work on the circulation of the ovary and described the Clark position for lymphatic drainage in peritonitis.

In 1899 he accepted the professorship of gynecology at the University of Pennsyl-

the pathological picture to his auditors. He was among the first to employ the lantern slide, the blackboard and clay modeling in the teaching of his specialty, believing that visual demonstration was more lasting than the most oratorical description.

Clark was a developer of men. Many of his former assistants are occupying professorial positions in our great universities. His successor is a man whom he trained.

During the thirty-five years of his active professional life he held appointments at Johns Hopkins, the University of Pennsylvania, the Woman's Bryn Mawr, Chestnut Hill, Germantown and St. Agnes' Hospitals.

He was a past President of the American Gynecological Society, and the Congress of Clinical Surgeons of North America, and Chairman of the Section on Obstetrics and Diseases of Women of the American Medical Association.

He was a man of charming personality and sterling character, and a delightful companion whose conversation was rife with illustrative anecdote. His prolific writings were always tempered with conservatism and carried weight wherever they were read. Probably no man in America has done more for the development of gynecological diagnosis than John G. Clark; and in his death we have sustained a very great loss.

JOHN OSBORN POLAK.

## NEW YORK AND NEW ENGLAND ASSOCIATION OF RAILWAY SURGEONS

THE thirty-seventh annual meeting of the New York and New England Association of Railway Surgeons will be held at the Hotel Pennsylvania, New York, October 21 and 22, 1927. The first day will be devoted to clinics and the second to papers and their discussions. These will be published in the JOURNAL.



Subscribers to THE AMERICAN JOURNAL OF SURGERY visiting New York City are invited to make the office of the publishers (Paul B. Hoeber, Inc., 76 Fifth Avenue, New York) their headquarters. Mail, packages or bundles may be addressed in our care. Hotel reservations will gladly be made for those advising us in advance; kindly notify us in detail as to requirements and prices. List of operations in New York hospitals on file in our office daily.



## BOOK REVIEWS

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**FRAKTUREN UND LUXATIONEN.** Ein Kurzgefasstes Lehrbuch für Ärzte und Studierende. By Dr. K. H. Bauer, Prof. für Chirurgie, Univ-Göttingen. 8vo. Paper. Pp. 236; 237 illus. Berl. Julius Springer, 1927.

This is a very compact, well-written and well-illustrated volume on the treatment of fractures and dislocations. The author has the faculty of presenting the subject in a terse, clear manner which makes the book interesting reading. However, there is nothing in the volume to make it of especial value to the American medical public, with its wealth of comprehensive works on this subject. The present volume is intended primarily for students but may quite easily be used as a ready reference work for those more conversant with the subject.

**LA PRATIQUE CHIRURGICALE ILLUSTRÉE.** By Victor Pauchet. Pt. 10. 8vo. Paper. 50 Fr. Pp. 250; 235 figs. Par. Gaston Doin & Cie., 1927.

The tenth part of Pauchet's "Practical Surgery Illustrated" discusses and depicts the treatment of lingual goiter, hydatid cysts and abscesses of the liver, lesions of the internal meniscus of the knee, cancer of the rectum, etc. As in the earlier volumes, the amount of text is reduced to a necessary minimum and the main emphasis is laid on the careful depiction of the various steps in the different operations by excellent drawings. Indeed, the schematic illustrations and the drawings are so well presented that the text can be almost ignored without in the least detracting from the value of the work. In the very brief text, the author proposes and answers a number of detailed questions that may arise in the mind of the surgeon both in the diagnosis and in the operative technique. Written by an essentially practical surgeon and intended primarily as a handbook of practical surgery, there is but little of theoretical discussion or of bibliographical reference. The work is a description of the technique employed by a great and experienced surgeon and as such is entitled to respectful inclusion among the works of the great surgeons of the world.

**URINARY SURGERY.** A Handbook for the General Practitioner. By William Knox Irwin, M.D., F.R.C.S. (Eng.); Surgeon to Out-Patients, St. Paul's Hospital for Genito-Urinary Diseases. Ed. 2. 16mo. \$4. Pp. 271. N. Y. William Wood & Co., 1927.

The present, second edition, of Irwin's volume on urinary surgery has been enlarged by the addition of four chapters. The first two chapters deal with the anatomical configuration of the urinary tract and the methods of examination of the patient complaining of urological symptoms. The following seven chapters are devoted to a discussion of the chief symptoms for the relief of which the patient seeks medical advice. In the last four chapters, the author gives a very sketchy outline of the surgical procedures recommended in the treatment of the different urological conditions. The volume makes no pretense at being a textbook on the subject. It serves in an admirable manner as a handbook for the general practitioner—the purpose for which its author prepared it. The volume makes solid but very clear and interesting reading.

**LEHRBUCH DER PHYSIOLOGIE.** By Prof. Dr. Emil Abderhalden, Halle. Pt. 4. Die Motorische System. 8vo. Pp. 648; 211 illus., 1 col. pl. Berl. Urban & Schwarzenberg, 1927.

This constitutes the fourth and concluding part of Abderhalden's great work. Taken together with his monumental work on physiological chemistry, it forms a tremendously learned and stimulating introduction to the study of physiology. Undertaken and presented in the form of a series of lectures for the student of physiology, it may well serve as a guide for the research worker in this field. In the wealth of its bibliographical references, in its erudition and in the inspired style of its presentation, the work is worthy of lasting consideration. The present volume is devoted to a discussion of the motor system and its closely allied system, the central nervous system. It discusses not the nervous nor the muscular system but rather the neuromuscular system, the functional unit with the pathology of which practically every physician must at one time or another

cope. The volume is illustrated with a great number of well-chosen drawings and diagrams.

**EXPLORATION CLINIQUE ET DIAGNOSTIC CHIRURGICAL.** By Félix Lejars, Prof. de Clinique Chirurgicale à la Faculté de Médecine de Paris; Ed. 2. 8vo. Cloth. 120 Fr. Pp. 911; 1094 photos and orig. draw. Par. Masson et Cie, 1927.

In this volume, which appears in its second edition in four years, Lejars has attempted to present to the medical public a textbook on surgical diagnosis which shall train the physician in the clinical methods of approach to a given surgical problem. Preeminently a clinician, the author's main interest has been devoted to the discussion of clinical methods. While admitting the great value of the laboratory diagnostic methods, Lejars insists that the physician should have been so trained that put in a situation where these laboratory aids are not available, he will still be in a position to make an intelligent survey of the surgical condition.

With this idea in mind, the author has set himself two questions: What must be thought of, and how must the examination be undertaken? For the purpose of better discussing these problems the subject matter has been topically divided. Thus there are chapters devoted to a consideration of the injuries and diseases of the head, the neck, the face, the abdomen, the extremities, etc. Under each of these divisions, the author conducts the description as if a patient were present. The appearance of the patient, the proper method of approach and the various clinical diagnostic procedures are treated in detail.

The volume is replete with excellent illustrations showing the exact method of performing the various tests and the results to be expected. The text is simple and interesting. The present edition differs from the first mainly in the number of illustrations.

**DIE CHIRURGIE.** Eine zusammenfassende Darstellung der allgemein und der speziellen Chirurgie. Ed. by Prof. Dr. M. Kirschner and Prof. Dr. O. Nordmann. Pt. 15. Die

Chirurgie der Milz. Die Chirurgie der sog. Blutkrankheiten. By Dr. A. Weinert, Magdeburg 8vo. Pp. 23 8; 86 illus., 2 col. pl. Berl. Urban & Schwarzenberg, 1927.

The fifteenth part of the system of surgery edited by Nordmann and Kirschner is devoted to a discussion of the diseases of the spleen and the closely allied diseases of the blood. On this very complicated and as yet imperfectly understood subject, the author sheds a great deal of light both by the conciseness of his discussions and by the clarity of his classifications. The physiology of the spleen, the various clinical and pathological pictures presented in splenic disease as well as the operative steps to be employed in the treatment of these different conditions are described in an altogether satisfying manner. The whole problem of diseases of the blood is necessarily bound up from both a diagnostic and therapeutic viewpoint with the diseases of the spleen and is appropriately considered a part of the discussion of the spleen.

The whole volume is presented in the same delightful reading style that has characterized the earlier parts of this excellent system of surgery and with a wealth of colored and half-tone illustrations such as have made German publications the envy of publishers the world over.

**GYNECOLOGICAL DIAGNOSIS AND PATHOLOGY.** By A. H. F. Barbour, M.D., LL.D., F.R.C.P., Formerly Lecturer on Gynecology in the University of Edinburgh and Gynecologist to the Edinburgh Royal Inf.; and B. P. Watson, M.D., F.R.C.S. (Edin.), F.A.C.S., Professor of Obstetrics and Gynecology in Columbia University. Ed. 3, 8vo.; Cloth. \$4. Pp. 223; 8 col. pl., 201 figs. N. Y. William Wood & Co., 1927.

This small manual has a greater interest for American readers now that one of its authors, Watson, has come from Edinburgh to the chair of gynecology and obstetrics in Columbia University College of Physicians and Surgeons. In this third edition revision has chiefly been in the sections dealing with uterine displacements and inflammations.



# PROGRESS IN SURGERY

*Selections from Recent Literature*

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CUSHING, HARVEY. Experiences with orbito-ethmoidal osteomata having intracranial complications. With the report of four cases. *Surg., Gynec. & Obst.*, June, 1927, xlv, 721.

In his inaugural presidential address before the American Surgical Association Cushing gives a critical report of four cases of orbito-ethmoidal osteomata, all in men, producing bizarre symptoms and severe cerebral lesions (pneumatocoele, mucocoele). In the first case the removal of the bony growth resulted in death from meningitis by infection through the opening left into the nasal tract. In the second case death also resulted from meningitis, attributed by Cushing to his failure to attack the growth. In the other two cases the tumor was successfully removed by transfrontal osteoplastic approach, as in the first case, and cerebrospinal rhinorrhea was prevented by laying over the opening left into the ethmoid cells a "stamp" of fascia taken from the leg—a procedure Cushing had quite similarly employed in a case of meningioma invading the frontal sinus.

PIOT, E., and LEDOUX-LEBARD. Roentgen therapy in the treatment of medullary tumors. (La roentgentherapie dans le traitement des tumeurs médullaires.) *Presse méd. Par.*, April 13, 1927, No. 30, p. 465.

The authors call attention to the value of the lipiodal injections in the diagnosis of intraspinal tumors. After operative interference roentgentherapy is of the greatest value whether it be in tumors which have been removed or in tumors which are inoperable either because of their position or because of their pathological structure. They report on four tumors in three of which the diagnosis was established roentgenologically. These included a perithelial sarcoma, a lymphosarcoma, a gliomatous tumor and a hemangioma. In the first three, cure followed operation and roentgentherapy. In the fourth case, operation was impossible because of the character of the tumor but roentgentherapy resulted in marked amelioration of the symptoms. The technique of applying deep roentgen-ray therapy in these cases is discussed.

COLEMAN, CLAUDE C., Richmond, Va. Treatment of spasmodic torticollis by intradural

posterior root section and extracranial division of the spinal accessory. *Virginia M. Month.*, March, 1927, liii, 761.

Coleman reports a case operated upon by by him with good results after the following procedure:

With the patient placed on a cerebellar frame, a midline incision was made from just above the external occipital protuberance to the sixth cervical spine. A short horizontal incision above the superior curved line crossed the median incision. The laminae of the first, second and third vertebrae were removed and the posterior rim of the foramen magnum, along with an area of bone about two inches in diameter, mostly to the right side, was rongueured away. The dura was opened and a superficial examination made of the right cerebellopontine angle. Nothing abnormal was discovered. The posterior roots of the first, second, third and fourth nerves were divided on each side. The identification of the first right posterior root was not accurate. The second cervical nerve root required ligation before division, because of a vessel of considerable size which accompanied the nerve root. The spinal filaments of the accessory nerve were brought into view and a section made of some of the lower ones. The dura was carefully closed and a closure of the muscles and skin made in layers. Spasm of the posterior muscles did not return after the operation but there was some deviation of the chin to the left. During the following two weeks and before the spinal accessory was divided, it was possible to make careful observation as to the effects of posterior root division alone. The right accessory nerve was then resected under local anesthesia, just proximal to its entrance into the sternomastoid muscle.

SPIELBERG, WILLIAM, New York. Visualization of the Eustachian tube by the roentgen ray. Preliminary report. *Arch. Otolaryngol.*, April, 1927, v, 334.

By employing a proper technique, roentgenograms can be made of the Eustachian tube. The roentgenograms show that the Eustachian tube assumes the course of an inverted S, making two curves as it leaves

the tympanic cavity arching downward and forward across the space between the anterior canal wall of the bony external auditory meatus and the condyle of the mandible. Crossing the latter, it continues in its course downward for from 15 to 20 mm. and describes another slight curve downward and forward, terminating as the pharyngeal end in the pharynx.

Length of the tube is from 30 to 33 mm. from the mouth to the tympanic end. Its length can be increased by passing a metal filament into the tube, thus putting the membranous portion on a stretch.

The tympanic orifice of the Eustachian tube is from 2 to 2.5 cm. higher than the pharyngeal end, but in some cases has been found to be only 1 cm. higher. The osseous portion, as well as the tympanic opening, appears as a prolongation of the anterosuperior portion of the tympanic cavity. The superior wall of the tympanic cavity merges into the bony portion of the tube.

Bony and membranous portions can easily be differentiated from one another and their course visualized. The bony portion forms one third and the membranocartilaginous portion two thirds of the entire length of the Eustachian tube. The width of the bony portion was found to vary between 2 and 3 mm., the width of the membranous portion between 1 and 1.5 mm. Strictures or stenoses can be distinctly visualized and located.

Iodized oil instilled into the tube was retained only a few minutes. Both the act of swallowing and the action of the ciliae cause the rapid evacuation of the foreign matter injected into the tube. This, however, was found not to be the case in patients with dilated tubes or in those in whom atrophic changes had taken place in the lining epithelium. In one such case the roentgenogram showed the presence of iodized oil one week after the initial injection.

VAN METER, E. R., St. Louis. Intranasal radium therapy in malignant and benign tumors. With case reports. *Arch. Otolaryngol.*, March, 1927, v, 225.

From observations on ten cases, and from the observations of other writers, Van Meter draws the following conclusions:

1. Malignancies occurring in the nose or nasopharynx are far more frequent than even the most conservative believe.

2. More careful study by the rhinologist of this type of case, especially of the nasopharyngeal space, should be made.

3. In certain malignancies, when diagnosis is made early, radium offers greater possibilities as a therapeutic agent than any other known remedy.

4. In persistent, recurrent cases of nasal polypi, combined surgical and radium treatment is to be preferred, and a certain number of these patients recover under this treatment.

5. Larger doses of radium should be used, and the radium should be administered in one dose rather than in divided doses.

6. Radium should not be used until four weeks after operation.

ROY, J. N., Montreal. The method of choice for the correction of saddle nose. *Arch. Otolaryngol.*, March, 1927, v, 258.

Roy believes the ideal method for correction of depressed nasal deformities consists in making an internal incision and, having prepared a tunnel, inserting cartilage of the first floating rib. When the graft is placed in position, the application of two little bands of adhesive tape transversally to the nasal bones fixes it, and consequently offers better conditions for adhesion with the surrounding tissues. Carried out in this manner, the operation is more likely to be successful than by any other method.

HARRIS, THOMAS J., New York. Is radium a cure for cancer of the larynx? An inquiry based on a study of the end-results. *Arch. Otolaryngol.*, April, 1927, v, 301.

Gradually, as not merely failures resulted, but as suffering apparently was increased under the treatment and death hastened, the conclusion was reached that radium in the treatment of malignant disease of the larynx up to date has been harmful.

Harris has ceased to use radium unless for some exceptional reason. If the case has reached the stage in which operation is ruled out, such measures are used as will make the patient as comfortable as possible without adding to his suffering, by increasing the obstruction in the larynx, as radium often has seemed to do. For such obstruction a simple tracheotomy has been seen to give the desired relief in more than one case.

If operation is indicated, radium is not substituted. In case operation is refused, radium

would not be advised until other measures have been carefully considered.

STILES, PORTER, Birmingham, Ala. Vegetal bronchitis: observations on fifteen cases. *South. M. J.*, April, 1927, xx, 269.

The aspiration of vegetable substances, especially by children, produces a much more severe local and systemic reaction than is the case with metallic foreign bodies.

Vegetable foreign bodies are quite apt to remain movable in the trachea with the consequent danger of subglottic impaction and asphyxiation, while the likelihood of their swelling from moisture is an added menace.

The systematic enlightenment of parents and nurses, as to the danger of giving peanuts, watermelon and similar substances to young children, would materially reduce the number of these accidents.

Left untreated, these cases are almost invariably quickly fatal; if subjected to early bronchoscopy, the prognosis is distinctly favorable.

BRAM, ISRAEL, Philadelphia. Relationship of diseased tonsils to goiter. Observations based upon a series of 9864 goiter cases. *Med. J. & Rec.*, April 6, 1927, cxxv, 442.

Bram concludes:

1. In simple goiter it is doubtful whether diseased tonsils play an etiological rôle. Hence, tonsillectomy, without the administration of additional therapeutic measures, usually fails to cure the patient.

2. Hypertrophied tonsils without evidences of infection are frequently coincidental with simple goiter of the hypertrophic, colloid, and hyperplastic types during puberty and adolescence and if nonobstructive, may remain.

3. Diseased tonsils appear to play a minor rôle in the assumption of toxicity (hyperthyroidism) by a previously nontoxic goiter. Tonsillectomy in these cases may result in a degree of amelioration of toxicity but the goiter itself is unaffected.

4. In exophthalmic goiter diseased tonsils often play a contributory etiological rôle. The major factors are apparently the predisposing neuropathic make-up of the individual, superimposed upon which a psychic trauma appears to be the usual exciting cause of affection. Tonsillectomy in exophthalmic goiter with the expectation of curing the disease is usually disappointing; this procedure should be regard-

ed as merely supplementary to more direct therapeutic measures.

5. Despite frequent disappointments as to results, diseased tonsils should be removed in all goiter cases. Care must be exercised in toxic adenoma and especially in exophthalmic goiter that tonsillectomy be performed at a time when the resultant reaction would appear to be negligible.

JACKSON, ARNOLD S., Madison, Wis. Primary thyroidectomy for exophthalmic goiter. With a report of 120 cases. *Surg., Gynec., & Obst.*, March, 1927, xlv, 406-411.

The reduction in the surgical mortality in exophthalmic goiter is due to several factors: (1) Patients are being brought to the surgeon in the early stages of the disease; (2) physicians are now recognizing hyperthyroidism in its incipency; (3) the perfection of surgical teamwork has reduced the time required for operation; (4) the use of the morphin-seopolamine-novocaine as an anesthetic has eliminated certain operative complications; (5) the basal metabolic unit has enabled the physician and surgeon better to judge the patient's condition, and (6) the discovery by Plummer of the efficacy of iodine has been a great aid to surgery.

Jackson abandoned the ligation-operation and stage-operation in 1924, and this series of one hundred and twenty consecutive cases, in which only primary thyroidectomy was performed, is presented to show the benefit to be derived from iodine. At first it was used in only small amounts; then the dosage was increased and the period of pre-operative preparation shortened. Attention was called to the remarkable change in the pathologic picture of the gland; hyperplasia was replaced by colloid and the gland tended to revert to normal.

The period of preparation in this series was usually one week; the longest period was two weeks. When a patient showed marked loss in weight and strength, or cardiac complications had occurred, he was sent to the hospital for preparation. About one-third of this series were in this group. When these conditions are severe, it may be necessary to delay operation longer, but it should not be delayed too long, since a tolerance to iodine may develop and operation is then performed with considerable risk. Patients were encouraged to be up several hours a day except in case of cardiac decompensation. The diet was increased to the equivalent of 4500 calories a day; luminal was

used as a sedative. The average dose of iodine (Lugol's solution) is forty drops daily in four doses, well diluted. The use of ice bags has been discontinued except during a crisis with fever; at this time the dosage of iodine is increased.

Clinical improvement of the patient was noted within forty-eight hours. The frightened, anxious, staring expression had disappeared; the restless, purposeless movements were replaced by a quiet demeanor; the pulse was slowed, and the patient no longer complained of a rapid, pounding heart; the pulse pressure decreased and the thrill and bruit often disappeared.

In this series there was an average reduction in the basal metabolic rate of +16; the average rate was +46 before treatment and +30 after treatment. In only five cases was operation performed when the metabolic rate was more than +50.

In every patient with the exception of a nine-year-old boy only local anesthesia was used. In order to insure the best prognosis as much of the gland as possible should be removed, only a small strip being preserved on the posterior border sufficient to protect the recurrent laryngeal nerves and the parathyroids. One lobe was always resected, the vessels ligated and the field cleared before proceeding to the opposite lobe. Iodine was given postoperatively by mouth and by rectum, one hundred drops or more in twenty-four hours. Water and morphine were given freely. In one case postoperative pneumonia occurred. Postoperative infection and permanent injury to the nerve did not occur. One patient died because iodine was not administered until ten hours after operation.

The time that has elapsed since operation is too short to state that permanent cures have resulted, but 92 per cent of the patients consider themselves cured or greatly improved. Practically every patient is performing his normal duties. There has been an average gain in weight of twenty-one pounds. The pulse rate in most cases has dropped from 120 to 79.

BALDRIDGE, CLARENCE W., and PETERSON, FRANK R., Iowa City. Splenic enlargement in hyperthyroidism. *J. Am. M. Ass.*, May 28, 1927, lxxxviii, 1701.

Splenic enlargement in hyperthyroidism is more frequent than one would be led to believe

from its lack of mention in the literature. One hundred and forty-four patients with exophthalmic goiter were studied by Baldridge and Peterson, within six months. Of these, forty-four have had palpable spleens. From none of the patients with enlarged spleens were the authors able to obtain a history of malaria or other disease usually associated with splenic enlargement. During the same period, eighty-one cases of adenomatous goiter were observed. Hyperthyroidism was present in forty-two of the eighty-one cases, but in no instances were there the typical manifestations of exophthalmic goiter. Only three patients of this group had palpable spleens. The cause for enlargement of the spleen in exophthalmic goiter is not clear. It does not seem justifiable to account for the splenic enlargement in hyperthyroidism as being due to any specific antagonistic action between the spleen and the thyroid gland. The authors are not inclined to attribute the splenic enlargement in hyperthyroidism to an increase in the destruction of red blood cells. Two possible explanations for the splenomegalia are apparent from the study of these cases: First, that the splenic enlargement is passive and is secondary to cardiac failure or to cirrhosis of the liver, either toxic or cardiac; and, second, that the enlargement of the spleen is an active process with lymphoid hyperplasia and is only a part of a generalized hyperplasia of lymphoid tissue. Of these the latter seems the more plausible. The patients, as a group, have not been followed long enough to warrant a positive statement in regard to decrease in size of spleen following operation. In the four fatal cases in which necropsy was obtained, the spleen showed marked lymphoid hyperplasia, as did all the other fixed lymphatic tissues. In this series of cases, palpable spleens were found almost exclusively in those patients presenting the clinical features of exophthalmic goiter.

SANTE, L. R., St. Louis. Massive (atelectatic) collapse of the lung, with especial reference to treatment. Report of an additional case. *J. Am. M. Ass.*, May 14, 1927, lxxxviii, 1539.

The treatment recommended consists in rolling the patient back and forth on the uninvolved side. No other therapeutic agent is necessary. This simple procedure has, in all instances in which it has been used, proved successful in promptly reestablishing aeration of the lung.

ROCH, M., and FROMMEL, E., Geneva. Local anesthesia in the treatment of visceral and serous pains. (Anesthésie locale sous-cutanée dans le traitement de douleurs d'origines viscérales et séreuses.) *Presse méd. Par.*, March 26, 1927, No. 25, p. 385.

The authors report on eighteen cases of angina pectoris, acute pericarditis, pulmonary gangrene, pleurisy, cholecystitis, etc., treated by the method suggested by Lemaire several years ago. This consists in subcutaneous local infiltration of 10 c.c. of a 0.5 per cent solution of novocaine over the area of referred visceral pain. The authors incline to the opinion expressed by Mackenzie that by this procedure they are able to interrupt the efferent pathway of a viscerosensory reflex and thus afford relief to the patient. The only inconvenience in the method is that if applied to conditions that may be surgical in character, there is danger of masking symptoms.—HENRY MILCH.

KOENNECKE, W., Oldenburg. Adhesive pericarditis and its surgical treatment (Schweilige Pericarditis und ihre chirurgische Behandlung). *München med. Wchnschr.*, April 22, 1927, lxxiv, 675.

Adhesive pericarditis is characterized by no definite clinical picture. The history of a previous acute pericarditis, the presence of an enlargement of the liver and a marked ascites and the fluoroscopic appearances of an abnormally quiet cardiac pulsation make the diagnosis. Surgically, two types may be differentiated: that in which the pericardium is adherent to the anterior chest wall; and that in which the pericardium is concentrically thickened and impairs heart action. In the former instance simple removal of the third to sixth ribs anteriorly to allow expansion of the heart is sufficient to insure amelioration of symptoms. In the second type, simple removal of the ribs is insufficient and the heart must, in addition, be freed of its impeding fibrous envelope. To facilitate removal, a portion of the left sternal margin must be removed and the fibrous envelope incised over the left ventricle. Thereupon the rest of the membrane is removed by the use of the finger, care being taken not to puncture the heart wall. It is apparently unnecessary to carry dissection beyond the ventricles. The wound is completely closed leaving only a few strands of catgut to act as a drain. Unless the liver has been irreparably damaged, relief should be prompt.

LOEVENHARDT, A. S., and CRANDALL, L. A., Madison, Wis. Calcium carbonate in the treatment of gastric hyperacidity syndrome and in gastric and duodenal ulcer. *J. Am. M. Ass.*, May 14, 1927, lxxxviii, 1557.

Calcium carbonate used without any other inorganic salt is the best antacid for use in the gastric hyperacidity syndrome, and in gastric duodenal ulcer, for the following reasons:

1. It is exceedingly bland.
2. It is insoluble, being only a potential alkali, i.e., an alkali in the presence of acids stronger than carbon dioxide.
3. It is without effect on the bowel.
4. It causes the minimum disturbance of the acid-base equilibrium of the body and of the mineral metabolism.

It is practically foolproof in the hands of the patient. It is best used in the form of compressed tablets which disintegrate readily and which contain a very small amount of a carminative, such as oil of cinnamon.

SEBÉNING, W., Frankfurt. Late results after acute necrosis of the pancreas. (Folgezustände nach akuter Pankreasnekrose). *Med. Klinik*, April 15, 1927, xxiii, 551.

The author has been able to follow over a period varying from one-half to seventeen years, twenty-one patients who survived after operation for acute necrosis of the pancreas. He comes to the conclusion that:

1. Transitory disturbances of carbohydrate metabolism are frequent within the first one-half year and even after the lapse of many years diabetes and even death from diabetic coma may supervene;
2. Disturbances arising from the lack of the external secretions of the pancreas are rare and can be easily controlled by the administration of pancreatic extracts;
3. Recurrences are extremely rare;
4. The formation of pancreatic cysts is but very occasionally seen;
5. Fistulas usually heal spontaneously;
6. Adhesions seldom cause any trouble;
7. Incisional hernias are relatively frequent.

SAUNDERS, H. P., Chicago. Surgical treatment of congenital umbilical hernia. *Ill. Med. J.*, March, 1927, li, 204.

The cord of every baby should be carefully examined for hernia immediately after delivery. The prognosis of large congenital umbilical



hernia is grave, but better in cases treated surgically than in those treated conservatively.

The quickest and least traumatic procedure consists of ligating the umbilical vessels securely as close to the abdominal walls as possible. The sac is then opened prolonging the incision up and down the abdomen above and below the umbilicus just as far as is necessary in order to replace the contents without having to squeeze and handle them too much. As soon as they are all replaced, the sac is removed, transfixed and ligated, thus closing the peritoneum. The other layers are then closed by through and through mattress sutures of silk-worm gut including all the layers and closing the entire incision in this manner.

MAYO, CHARLES H., and DIXON, CLAUDE F., Rochester, Minn. Retroperitoneal lipoma: A report of three cases. *Minn. Med.*, May, 1927, x, 272.

The symptoms of retroperitoneal lipoma are variable. Of twelve cases reported by Masson and Horgan six patients first noticed a sensation of increased pressure in the abdomen, six complained of slight abdominal pain and two of pain in the back. In only one case was the pain severe. Six complained of food distress and occasionally vomited. Five had quite obstinate constipation and six had lost weight. In cases in which the lipoma was degenerating the symptoms were acute, with fever, localized tenderness and an increase in leucocytes.

About 79 per cent of the tumors were in the abdominal cavity and 21 per cent in the pelvis. They usually arise from the pararenal fat, but may arise from the renal capsule, the mesentery, the pararectal or retrorectal fat. They occur quite equally on both sides of the abdomen, possibly more often on the left than right.

The ultimate prognosis is usually grave. In von Wahlfendorff's series the operative mortality was 25 per cent; in Masson and Horgan's series, 16 per cent. Recurrence is not uncommon and often with recurrence there is sarcomatous change.

Retroperitoneal lipomas are more common than has been supposed, and exploration should be carried out in all cases of abdominal tumor, particularly if the enlargement has been slow and no organic disturbance can be elicited. Retroperitoneal lipoma before removal often resembles sarcoma, grossly. A specimen should always be examined microscopically

and if no malignant change is found the tumor is usually removed.

Mayo removed the tumors through a right rectus incision 2.5 cm. from the umbilicus. This affords good exposure for exploration and can be extended as desired. It is apparently much better than the posterior incision advised by Krogus, which would be feasible for exploration of small tumors lying near the kidney. In these three cases the tumor spread within the mesentery of the transverse colon. Their origin was therefore on the left side of the spine. In two of the cases the omentum was taken up in the great spread of the tumor.

FAURE, J. L., Paris. The Mikulicz tampon in intestinal surgery. (*Le Mikulicz en chirurgie intestinale.*) *Presse méd.*, March 30, 1927, No. 26, p. 401.

Faure makes a plea for the employment of the Mikulicz tampon which has practically fallen into disuse. He shows that until some vaccine is discovered which will prevent the development of postoperative infections of the peritoneal cavity, the Mikulicz tampon is practically the only certain means of preventing death in a number of the serious intra-abdominal operations. Its use is especially desirable in cases of carcinoma of the uterus, in resections of the colon, and in purulent appendicitis. He points out that in a series of 36 cases of operations on the colon, the Mikulicz tampon was not used in 20 cases with an operative mortality of 40 per cent. In 16 cases in which the Mikulicz tampon was used, the operative mortality was only 13.3 per cent although these cases were more serious than those in the other series. Of 9 cases of abdominoperineal resection of the rectum for cancer, only one died. Of 15 cases of purulent appendicitis, 9 with generalized peritonitis, operated upon by Roux-Berger using the Mikulicz tampon, there were no deaths and only one with weakness of the abdominal wall. In 13 similar cases with 5 generalized peritonitides in which the tampon was not used, 4 died, 3 had stercoral fistulas, 2 had purulent pleurisy, 2 eventrations and only 2 healed without any untoward incident.—HENRY MILCH.

KILDUFFE, ROBERT A., Atlantic City. Concerning the Sgambati urine test in peritonitis. *J. Med. Soc. N. J.*, April, 1927, xxiv, 221.

In 1920, Sgambati described a urine reaction

which he believed to be applicable to the diagnosis of peritonitis. The test is applied as follows: To 6-8 c.c. albumin-free urine in a test-tube, 2 or 3 c.c. pure nitric acid are added without mixing. If the test is positive (first phase) a bluish-gray color appears at the point of contact of the urine and acid. The second phase of the reaction is elicited by adding 2 or 3 c.c. chloroform, when, in positive cases, the color becomes ruby red and diffuses throughout the tube on standing.

Kilduffe believes, with Marcialis, that the first phase of the reaction is probably influenced by the indican content of the urine and is of no particular significance. While the reaction does not appear to occur promiscuously, neither is it uniformly encountered in peritonitis, nor is it diagnostic of nor specific for this disease. It does not appear to be of sufficient value to warrant its addition to the usual methods of laboratory study employed in this condition.

KENDIG, EDWIN L., Victoria, Va. Conservation of the function of the cervix in the treatment of chronic endocervicitis. *Virginia M. Monthly*, May, 1927, liv, 94.

In selecting a method of removing the infected areas of a chronic endocervicitis consideration should be given to conservation of the function of the cervix. Cautery stripping and enucleation seem to offer the best methods of conserving this function. Of the two, cautery stripping, when indicated, is the better method.

COTTE, G., and BERTRAND, P., Lyons. Implantation of tube into the uterus (L'implantation tubo-utérine). *Gynéc. et Obstét.*, 1927, xv, No. 3, 182.

The authors call attention to the fact that in sterility of tubal origin, the site of obstruction is frequently at the ampulla. In order to overcome this obstruction, they advise resection of the ampullary end of the tube and its reimplantation into the fundus of the uterus. The technique is similar to that used in reimplanting ureters into the bladder. The end of the divided tube is threaded and the thread is simply passed by a needle into the fundus of the uterus and held in place by several peritoneal sutures. The authors report fifteen cases in which this operation was performed and noted in the literature either by themselves or by others.—HENRY MILCH.

VILLARD, E., and LABRY, R., Lyons. Retrograde subserous salpingectomy. (De la salpingectomie rétrograde sous-séreuse.) *Gynéc. et Obstét.*, xv, No. 4, 259.

The authors call attention to the advisability of conserving ovarian and uterine function in the presence of adnexal infections requiring ablation of the tubes. In such cases, they suggest subserous removal of the tubes in the manner described by them. Their method permits of complete reperitonealization of the stump, leaves the ovary with an adequate vascular supply and precludes the necessity of removal of the ovary. The ampullary end of the tube is resected and then by means of two parallel incisions along the mesosalpinx the tube is freed and removed without injuring the ovarian blood supply. The mesosalpinx is then sutured. This procedure is of value in cases of ectopic pregnancy, where the ovary must be kept in order to prevent the onset of artificial menopause and in cases where the massive adhesions make the liberation of the adnexa difficult.

HERMITTE, J., and DUPONT, R., Paris. Enervation of the ovary. (De l'enervation de l'ovaire.) *Gynéc. et Obst.*, 1927, xv, No. 35, 161.

The authors observe that the so-called sclerosing type of ovaritis associated with pain and frequently treated by partial resection is usually accompanied by interstitial fibrotic changes about the terminal sympathetic nerves. It is this involvement of the nerve fibers that causes the pain and it is the section of these sympathetic fibers in the various sympathectomy operations which has brought relief to the patient. The authors' study of the anatomy of the ovarian nerves shows that the best place to attempt treatment of these fibers is at the hilus, just as they enter the ovary. They suggest that through a small incision in the broad ligament, the ovarian vessels be exposed, isolated and ligated. This assures complete severance of the pain-carrying nerves. The operation is simple in technique.

HENRY MILCH.

WOLFE, SAMUEL A., Brooklyn, N. Y. Ovarian luteoma, with case report. *Am. J. Obst. & Gynec.*, May, 1927, xiii, 575.

The author describes in detail clinical history and gross and microscopic findings of a true ovarian luteoma. The cells are of the pale

type but granular, grow diffusely or in alveoli, and have not contact with capillaries. The tumors are gray-yellow on gross appearance.

Lutein tumors of the ovary have been erroneously interpreted as "ovarian hypernephromata." The yellow color of these tumors, the clear cells, and the intimate relation to capillary walls are insufficient criteria to show suprarenal cortex histogenesis. The normal corpus luteum in several of its developmental and regressive phases possesses gross and histologic features that mimic suprarenal cortex structures. Tumors of lutein origin retain some or all of these characters.

ROSENZWEIG, MAXWELL, Brooklyn, N. Y.  
Synectial endometritis and synectioma.  
*Am. J. Obst. & Gynec.*, May, 1927, xiii, 563.

Two cases are presented of transitional lesions in the chorioma group: (a) Synectial endometritis; (b) synectioma. The lesions are essentially benign. The treatment of synectial endometritis is conservative, curettage being the method of choice in the majority of cases. Without the recognition of the synectial or transitional group the malignant tumors cannot be interpreted properly.

A review of the literature shows that there is not a general cognizance of these lesions and that many cases reported as typical malignant chorioepithelioma are really of these transitional types.

JUDD, E. STARR, and SIMON, HAROLD E.,  
Rochester, Minn. Hemorrhagic cysts of the  
kidney. *Surg., Gynec. & Obst.*, May, 1927,  
xliv, 601.

Simple hemorrhagic cysts of the kidney form a distinct group apart from the serous cysts and the hemorrhagic cysts occurring in conjunction with neoplasms. The etiology is obscure and none of the hypotheses proposed thus far are entirely satisfactory. The suggestion that the cysts may originally have been aneurysms is the most acceptable one and is the only one that is entirely consistent with clinical and pathological findings.

The cysts rarely occur and their symptoms are not characteristic. The diagnosis has rarely if ever been made pre-operatively, and even at operation it may be difficult to know that one is not dealing with a neoplasm.

Treatment is surgical, consisting in resection of the cyst when feasible, otherwise in nephrectomy.

HINMAN, FRANK, San Francisco. Pyelovenous backflow at the time of pyelography. *Surg., Gynec. & Obst.*, May, 1927, xlv, 592.

The interlobar veins pass up next to the wall of the calyces, and in some places are in almost direct contact with the mucosa of the calyces, large venous spaces being seen in close relation to the lumen of the calyces on microscopic section. These interlobar veins arch around the pyramids in these calyceine fornices, and it would seem to be mainly at this point that a pyelovenous communication is first established.

Pyelovenous backflow frequently occurs at the time of pyelography and tubular backflow for a short distance into the papillary ducts also occurs. In the case of pyelovenous backflow, radiation into the cortex first appears as a cone or funnel deformity from the base of pyramids, and if back pressure is sufficient may later show the arching from filled anastomotic venous arches. Radiation into the cortex then appears along the interlobular veins, a picture that never occurs with tubular backflow in which there is a short brush-like radiation from the tip of the papilla into the medulla for a short distance. Such pyelovenous and papillary backflow when unrecognized may lead to errors in interpretation of pyelograms.

BLAUSTEIN, NATHAN, New York. Cystography an invaluable aid and advanced method of diagnosis of tuberculosis of the genito-urinary system. Preliminary report of investigation. *J. Urol.*, May, 1927, xvii, 469.

Blaustein asserts that the least dangerous of all methods of diagnosing tuberculosis of the genitourinary tract is the simple procedure of making cystograms. In tuberculous lesions, whether affecting kidney, ureter or bladder singly or collectively, the cystogram will reveal a pathologic state of the bladder never so graphically demonstrated heretofore. The pathologic entity is so conclusive that it constitutes a diagnostic certainty. A cystogram demonstrates the splinting of the bladder wall on the affected side; and whether the lesion is in kidney, ureter or bladder the picture is the same. Musculature of the bladder wall on the affected side is in a high degree of spasm, is rigid and unyielding, and instead of the globular roundness seen in the normal bladder there is sharp flatness beginning at the dome

and ending at the base. Blaustein proposes the term "incline bladder" for this condition. He uses a 2 per cent or 2.5 per cent solution of sodium iodide instead of the 12.5 or 15 per cent strength commonly used for this work.

BALLENGER, EDGAR G., and ELDER, OMAR F., Atlanta, Ga. Post-operative cystitis. *South. M. J.*, April, 1927, xx, 321.

Concerning the cause or causes of the cystitis which follows operations, when the bladder has become overdistended and urethral catheterization is required, the general assumption seems to be that an infection has been carried by the catheter. Although this may at times be a factor, it is not the primary factor in the majority of instances. The actual cause of the cystitis more frequently is trauma in the form of small lacerations of the mucosa from sudden overdistention of the bladder. These minute injuries afford an entrance for organisms passing down from the kidneys or up through the urethra. When the distention of the bladder is gradual in onset, as in prostatic obstructions or tubercles, the pavement epithelium grows as the residual urine increases and the minute lacerations do not develop as they apparently do in rapidly distended bladders. Danger of prompt or repeated catheterizations is trivial compared with danger of injury to the bladder mucosa by overdistention. This view is strongly supported by the rarity of cystitis after operations when the bladder has not become overfilled and by the infrequency of cystitis from urethral instrumentation. Overdistention of the bladder always precedes this type of cystitis. The mucous membrane when damaged by overdistention or trauma from chemical agents becomes a less efficient barrier against infection, just as does the injured epidermis. Surgeons should leave a standing order after operations for careful observation of the patient's bladder in order that it may be emptied before harmful distention occurs. Furthermore, it may be of value, when catheterization becomes necessary, to inject a mild germicide into the bladder after it has been emptied to control or limit the infection if damage has been done to the mucosa by the overdistention.

MOORE, THOMAS D., Memphis. The diagnosis of bladder atony. *J. Tennessee M. A.*, Feb., 1927, xix, 286.

Diagnosis of bladder atony is important

because of the evident tendency to ascribe the patient's symptoms to some obstructive condition, resulting in futile surgical interference. Two of the cases reported had been subjected to prostatectomy without relief, due to such erroneous diagnoses.

The outstanding features of the disease are five in number: (1) Marked urinary difficulty; (2) residual urine, usually a large amount; (3) the absence of any discoverable obstruction to the urinary stream; (4) poor detrusor tonus as noted by the slow dribbling from an inserted catheter or manometer reading, and (5) diminished sensory responses.

Three patients, two men and one woman, having atony of the bladder, were subjected to careful examination of the central nervous system, including study of the spinal fluid. In all of them the results were negative. Studies of the intravesical tension with a water manometer revealed a curve somewhat typical of the disease. Bladder sensory tests disclosed varying degrees of anesthesia for tactile, thermal, and pain stimuli. These findings favor the opinion that atony of the bladder is dependent upon some disturbance in the local nerve supply, probably a degenerative process involving the hypogastric plexus or interference with the reflex tract through the vesical center in the lumbar cord.

TURNER, B. WEEMS, Houston, Texas. Syphilis of the urinary bladder with report of six cases. *South. M. J.*, April, 1927, xx, 289.

Primary and secondary syphilitic manifestations in the bladder are as a rule comparatively insignificant. They vary from a generalized reddening of the mucosa to a discrete, macular or petechial reddening which readily clears under treatment of the disease. Vesical gumata are among the rare syphilitic manifestations, and as a rule are probably not recognized unless ulceration with secondary infection and hemorrhage directs attention to the bladder.

The characteristic pathological finding of syphilis of the bladder in its tertiary manifestations is a true cystitis, with thickening of the entire wall of the bladder and resultant contracture and reduction in its capacity. The lesions more frequently appear at the base, usually some portion of the trigone, and it is believed that this predilection possibly arises from the location of the lymph glands and glandular tissue in that region. Given a lesion in the bladder, the differential diagnosis is to be

made between clusive ulcer, papillomata, eareinoma, tuberculosis and sarcoma. It is not possible to make an absolute diagnosis with cystoscope alone, but certain characteristics are fairly significant and warrant seeking other evidences. Among these are generalized thickened, reddened mucosa with macules distributed at the base, pearly, opalescent papules occurring as bullae adjacent to the ulcer or papillomata, with an absence of the typical elevation and infiltration seen in malignancy.

It seems that syphilis is not a factor in production of papillomata, although two of Turner's cases showed definite papillomata, with papillary vegetations coexisting with the bladder lesion. It is also quite evident that malignancy can be engrafted upon a syphilitic lesion of the bladder.

TART, J. T., Melbourne. Prostatectomy and its after-results. *Med. J. Australia*, April 16, 1927, p. 571.

Of eighty patients admitted 82 per cent were operated upon in one stage and 18 per cent required the two-stage method. The two groups were distinguished by general clinical examination rather than by the renal function test.

The operative mortality for suprapubic prostatectomy in one stage was 4.6 per cent, the mortality for all cases being 8.75 per cent. In 85 per cent of one-stage operations for prostatic disease of innocent nature the late results were satisfactory, though 10 per cent of the patients had an attack of epididymitis after discharge from hospital. In the remaining 10 per cent there was persistent cystitis.

In 12 per cent of cases histological examination showed that malignant change was present in the prostate and of these patients only 50 per cent were well two years after operation. A relatively frequent sequel of two-stage prostatectomy was postoperative hernia, otherwise the late results were comparable to those of the operation in one stage.

SÉNÈQUE, J., Paris. Results of suprarenalectomy in spontaneous gangrene of the extremities. (*Résultats de la surrenalectomie dans les gangrènes spontanées des membres*). *Presse méd.*, April 9, 1927, No. 29, 454.

Sénèque reviews the literature on the treatment of gangrene and especially thrombo-angitis obliterans by means of excision of the

left suprarenal gland. He quotes the statistics of Herzberg in 110 cases, of which 8 were Herzberg's. Of this series, 14 were reported to have been cured. In all but three, results are too recent to be of much value. It has been claimed that there is definite amelioration of the symptoms, disappearance of pain, cure of the ulcers and in some cases even reappearance of the peripheral circulation. Sénèque observes with justice that this operation is falling into disrepute even among those who were its most staunch protagonists. He believes that the operation is not founded on firm anatomopathological grounds and that it finds no warrant in clinical experience.

HENRY MILCH.

PADGETT, EARL C., Kansas City. Free full-thickness skin transplantation. *J. Kansas Med. Soc.*, May, 1927, xxvii, 145.

The main advantages of the full thickness graft are: (1) Contraction is much less than following a Thiersch graft (a Thiersch graft does not give a satisfactory result in cases of marked deformity after burns); (2) in the palm of the hand, and other areas subjected to considerable trauma, full thickness grafts will give a good functional result if there is any soft tissue between graft and bone; (3) in certain congenital anomalies as in web fingers it offers a method giving a good result in one operation; (4) in certain disfiguring facial blemishes it has possibilities not possessed by other types of skin transplants.

If the bone is nearly bare or thickness is desired a flap transplant offers advantages not otherwise obtainable. The disadvantage of a flap is, first, that its thickness in certain areas gives a clumsy result less pleasing from the esthetic standpoint, and second, that several operations are required. The Wolfe graft can be transplanted usually in one or two operations. The flap transplant has its distinct indications and probably is more useful in the various phases of plastic surgery than the full thickness graft. The Thiersch graft has the advantage that it will grow in an unclean field. From the standpoint of appearance a full-thickness graft in successful cases is far superior to the Thiersch graft which is generally pale and white. The Wolfe graft in good "takes" appears, eventually, as normal skin.

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## LISTER'S CENTENARY\*

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**T**HIS is Lister's centenary. The name of Joseph Lister will ever be revered and remembered wherever surgery is taught as a science and practiced as an art. Probably there was never such an assemblage of learned and scientific men as was welcomed by King George in London on April 5 at the celebration of the centenary of the birth of Joseph Lister. In the hall of the British Medical Association numerous eulogistic addresses were delivered and in Westminster Abbey memorial services were held by the Bishop of Birmingham—certainly no such grand and glorious tribute was ever paid to the memory of any of England's "immortal dead who live again in minds made better by their presence."

Like that other miracle, William Shakespeare, Lister was born in a small village in the midst of the common people, at Upton in Essex County, thirty-four years after the death of the great Scotchman, John Hunter, who dominated the surgery of the eighteenth century as did Lister that of the nineteenth. The brains of these two men were the mighty looms that wove the indestructible fabric of England's surgical greatness—John Hunter the greatest surgeon up to Lister's time—Lister the greatest of all time.

Lister's father and grandfather were wine merchants in London. The father, Joseph Jackson Lister, was of an eminently scientific turn of mind. He perfected the com-

pound microscope; and "Lister's Law of the aplanatic foci remains the guiding principle as the pillar and source of all the microscopy of the age." In connection with Thomas Hodgkin, in 1827, the year of the birth of his son, Joseph, he determined the diameter of the red blood corpuscles and their rouleaux-formation. Lister's mother was Isabella Harris, a brilliant woman, and a teacher of elocution.

Joseph Lister attended private schools, at the age of seventeen entered the University College, London, was graduated A.B. in 1847, and five years later qualified in medicine. Lister was stricken with smallpox and was unable to commence his medical studies until 1848. He was, however, more fortunate than the brilliant Henry Gray, author of Gray's Anatomy, who was born the same year as Lister but died of smallpox at the early age of thirty-two. Lister, upon graduation at the University College, entered the University College Hospital and served for nine months as Erichsen's house-surgeon.

The mistake of speaking of Sir John Erichsen as an Englishman is frequently made. He was born in Copenhagen, in 1818, and the old family home, Le Palais Erichsen, is one of the show places of the Danish capital. Erichsen, like Lister, started out as a physiologist, but soon turned to surgery, and at the age of thirty-two, upon the retirement of Mr. Syme from the University College, London, was made a

\* Read before the Alabama State Medical Association, Montgomery, Alabama, April 20, 1927.

full professor there. In those days they "tried them out" before election, and Erichsen was given a lithotomy with Thompson, afterwards the great Sir Henry Thompson, who lithotritized Napoleon III, in 1872, holding the staff. On account of his myopia Erichsen was never a great operator, but measured up as a diagnostician and wrote the very Bible of surgery



Sir John Eric Erichsen.

in 1853. During our Civil War the U. S. Government had a special edition published and gave a copy to every surgeon in the Federal Army. On September 23, 1896, on the death of Sir John Eric Erichsen from angina pectoris, the profession lost one of the ablest literary exponents of the science of surgery of the generation.

Saturated with scientific heredity and a student and admirer of the physiologist, Sharpey, it is not surprising that the spirit of investigation and experimentation was early infused into Lister's mind and that his first paper, the year of his graduation, was upon the identity of the muscle of the iris and involuntary muscular fiber.

Having served his time in London, upon the advice of his former teacher and friend, Sharpey, he went to Edinburgh "to take six weeks of Syme's clinic" but remained six years and married Mr. Syme's daughter, Miss Agnes Syme.

When Mr. Syme was nineteen years of age he had charge of Robert Liston's dissecting room, but a quarrel with the great master, who never hesitated to cut off with his amputating knife a piece of his operating table to plug a bleeding bone, kept him out of the Edinburgh Royal Infirmary for a number of years. In 1829 he commenced teaching surgery and opened a private infirmary, Minto House, with twenty-seven beds, which was everywhere recognized except at home, and in popularity soon rivaled the Royal Infirmary. It was here that he first divided the sterno-cleido-mastoid muscle for torticollis. In 1833 Syme agreed to pay Russell fifteen hundred dollars a year to resign the chair of Clinical Surgery at the University and was appointed to the vacancy by the Crown. About this time Liston and Fergusson went to London and left Syme without a surgical rival in Edinburgh. With Liston, Syme revived flap amputation, first proposed by Lowdham of Oxford, and shared with Fergusson the honor of reviving excision of joints and is alone entitled to the credit of originating, in 1842, the operation of amputation at the ankle-joint, which bears his name. He devised many mechanical instruments, performed external urethrotomy for the cure of callous or impassible strictures, and demonstrated the function of the periosteum in repair of bone. Upon the death of his great enemy and cousin, Liston, who, it has been said, once was overheard demonstrating to his class the similarity of Syme's head to that of the chimpanzee, Syme succeeded to the Chair of Surgery in the University College Hospital, of London, but returned to Edinburgh before the end of the year. Upon his return home he devoted much time to the treatment of aneurisms. He was first in modern times to incise, turn out the clot



and tie each end of the diseased vessel in the carotid, axillary and iliac. J. Marion Sims said, "I have seen, all over the world, great surgeons operate, in my own country, in London and in Paris; but I have never seen such an operator as Mr. Syme." Syme was polemical and a born controversialist, immensely popular with the students, but disliked by his colleagues. His great friend and student, Dr. John Brown, the author of "Rab and His Friends," a pathetic story that need not blush in company with Hannah More's "Shepherd of Salisbury Plain," said of him, "He was almost always right in matter, sometimes wrong in manner." Mr. Syme is the surgeon in the story. Early in life Syme, who had a decided taste for chemistry, discovered that distilled coal-tar is a ready solvent of caoutchouc, which led to the waterproofing of cloth, and this process was patented by Charles Mackintosh. We owe our raincoats to the genius of Mr. Syme. Mr. Syme died in Edinburgh, in 1870, after his third paralytic stroke, and was succeeded by Lister, who was at the time in Glasgow.

We learn from Sir Hector Cameron, who was Lister's house-surgeon at the Glasgow Royal Infirmary in 1861, that he had seen as many as five cases of amputation of the leg die of pyemia in that institution in one week. This made a profound impression upon Lister, who at the early age of thirty-four had just been called to the Chair of Surgery, and he immediately went to work to investigate the cause. He taught that "the cause of suppuration in wounds was the decomposition of blood and serum retained within them, brought about in some way through the influence of the atmosphere." Sir Watson Cheyne tells us that in 1864 Lister, when walking home with Prof. Thomas Anderson, who held the Chair of Chemistry in the University of Glasgow, had his attention called to certain papers on fermentation and spontaneous generation which had recently been published by the French chemist, Pasteur. Lister read these papers and

found from Pasteur's experiments that it was minute living particles floating in the air or settling on surrounding objects in the form of dust, and not the gases of the air that the surgeon had to fear.

The problem that presented itself to the mind of Lister was how to destroy these microorganisms of the vegetable kingdom before and after operations, and if, as in



Professor James Syme.

compound fractures, they had already entered the wound, then how to destroy or inhibit their growth before they could get a foothold and spread. About this time Lister saw a newspaper article giving an account of carbolic acid, discovered by Runge in 1834, and its wonderful effect in cleansing the sewage of the town of Carlisle, and conceived the idea that carbolic acid might be used to kill the germs without detriment to the wound. Prof. Anderson

secured a supply of a purer specimen of carbolic acid which would dissolve in water, one to twenty.

In 1863 Jules Lemaire, a French pharmaceutical chemist, wrote a book on carbolic acid in which he accepted the germ theory as the explanation of putrefaction and recommended the use of carbolic acid for dressing wounds and "for all sorts of diseases." The book attracted very little attention and the work of Lemaire was not heard of by Lister until 1867, several years after Lister had used carbolic acid, when an anonymous letter attacking Lister was published in the *Edinburgh Daily Review* and the profession was flooded with reprints. This false and libelous communication was traced to Sir James Y. Simpson, "a very religious man who preached every Sunday" (Gross).

All honor to the names of Oliver Wendell Holmes and the martyred Hungarian, Ignaz Philipp Semmelweis; but as Lister knew nothing of their work and was in no way influenced by them, a review of their achievements would not be germane.

In 1867 Lister struck his level and laid down upon an eternal and unshakable foundation the great principle of the modern treatment of wounds. In his address before the British Medical Association he stated that septic properties depended upon minute organisms, that suppuration might be avoided by using some agent capable of destroying them, and recommended carbolic acid. He called the microorganisms which produce suppuration "dust particles," and believed that air infection was the great source of danger. His carbolic spray was the outcome. He soon discovered that these microorganisms were omnipresent, that the greatest danger was actual contact infection, and he recommended cleansing of the surgeon's and assistant's hands, patient's body, instruments, threads, and dressings. He saturated a piece of lint with pure carbolic acid and mopped the wound out, afterward covering it with the same material and holding it in position with

pieces of tin. The tin was daily removed and the dressings painted with pure acid. He treated abscesses by mixing pure carbolic acid with pus which formed a paste. He filled the wound with paste and covered it with tin. He next used as a dressing for all wounds antiseptic putty, made of carbolic acid, linseed oil, and carbonate of lime. The putty was found unwieldy and he used "antiseptic lac plaster," which is made by melting shellac and mixing it with carbolic acid. Its adhesiveness was highly objectionable, and he overcame it by painting the calico, saturated with shellac and carbolic acid, with "a solution of india rubber and benzine." The benzine was soon evaporated and the india rubber prevented the dressing from sticking. To prevent irritation from the acid he covered the line of incision with an oiled silk protective, which had previously been dipped in a solution of carbolic acid. We learn from Sir Hector Cameron that this was the dressing used by Lister when he returned to Edinburgh in 1869 as a successor to Mr. Syme. In the *Lister* number of the *British Medical Journal* Mr. Cheyne has an article in which he states that Lister in 1873 substituted carbolic gauze for lac plaster and introduced his spray. In 1890, when he discovered that the dust did not contain pathogenic microorganisms, he discarded the carbolic spray, washed the wound with a weak solution of bichloride of mercury, and substituted the double cyanide of mercury and zinc for the carbolic gauze. I heard Lister say in 1884 that he questioned the necessity of the spray but that his results had been so satisfactory that he was loath to make a change. I was impressed with his statement about the spray and in perfect agreement, as I couldn't figure out how to get the price of one of those big steam sprays out of my allowance. He used carbolic acid for disinfection of the skin and instruments. Just prior to his discovery, from 1864 to 1867, his mortality in major amputations was 50 per cent. From 1867 to 1869 his

mortality in the same class of cases was 15 per cent. In the face of these decisive and incontrovertible statistics Spence, Billroth, and other leading surgeons ignored his teaching and continued to empty their wards with a death-rate four times greater than his. Professor Ogston, of Edinburgh, first accepted it in its entirety, and he was soon afterward followed by Macewen, of Glasgow. A German, Von Bergmann, in 1886, was the first to use steam sterilization for instruments and dressings.

A son of a member of the Society of Friends, Lister was the antipode of his twin brother in science, the polemical, pugnacious, and unpeaceful Pasteur, who after the Franco-Prussian War in 1871 wrote to the Head of the Faculty of Medicine of the University of Bonn, "Efface my name from the archives of your Faculty and take back that diploma, the sight of that parchment is odious to me." When taunted and told at the British Medical Association at Plymouth in 1871 that "as his solutions become weaker and weaker his faith appeared to grow stronger and stronger" Lister did not swerve nor turn but intrepidly walked the highway of the right. His critics said the smell of carbolic acid would preclude its use; but in 1871 he was called by Sir William Jenner to operate upon Queen Victoria for a large abscess that had formed between the armpit and mamma, and he used carbolic acid. Her Majesty answered the criticism. Queen Victoria was the first patient upon whom Lister used a rubber drainage tube, though Chassaignac had used it in 1859. Lister cut the tube from a Richardson's atomizer that he had used the day previously to freeze the parts, and soaked it in carbolic acid. Sir Hector Cameron tells us that Lister was immensely pleased when King Edward VII said, "Lord Lister, I know well that if it had not been for you and your work I would not have been here today." The King referred to his operation for gangrenous appendicitis performed by Sir Frederick Treves

which was made possible by Lister, and at which he was present.

The immortal Master lived

To see his own work out

And watch the sandy footprints harden into stone.

Lister's active work as a surgeon ended in 1892 when he reached the age limit and retired from King's College Hospital. We have it upon the high authority of Sir St. Clair Thomson that Lister with a purely altruistic motive left the Royal Infirmary at Edinburgh, in 1877, where he had sixty to seventy beds, his lecture room crowded with enthusiastic, sympathetic and friendly students and foreigners, and went to King's College Hospital where only twenty-four beds would be allotted to him and his audiences would be cold, apathetic, and unfriendly, because London was the hotbed of his opposition and by going there he could sooner overcome the opposition, disseminate his great truths, and fulfil his mission in the world. Lowell has well said, "We breathe cheaply in the common air thoughts that great hearts once broke for." In 1895 Lister was elected President of the Royal Society and Mr. Cheyne says it gave him another five years of life.

In 1893 Mrs. Lister died under peculiarly distressing circumstances. She and her husband were botanizing in an out-of-the-way spot on the Italian Riviera when her death came after four days' illness of acute pneumonia. Lister was alone without a nurse or friend other than the local Italian doctor. He prepared the body for the difficult journey and distressing home-coming. She was truly his helpmate and after his death most of his papers were found in her handwriting. They had no children.

Never was there a more inspiring scene than on the celebration at the Sorbonne of Pasteur's seventieth birthday on December 27, 1892. With the band of the Republican Guard playing a triumphal march, Pasteur, worn and broken, leaning heavily upon the arm of the French President, Carnot, came upon the stage and fell into the

arms of Lister. This memorable meeting was portrayed upon canvas by the great artist, M. Rixens. It was like the meeting of Wellington and Blucher after Waterloo when the great Corsican commenced his melancholy march to St. Helena. It was the signal to the world that the surgery of the past, with its indescribable sufferings, miseries, misfortunes, and death was gone and forever, and that a new era, a golden age, of untold possibilities filled with hope, happiness and life for this and future generations had loomed. It was man's redemption of man. It was science in benediction with outstretched hands.

In 1875, though Lister's "turret torch was blazing high," like Leander, the surgeons in America would not see and could not hear. We find Dr. Samuel D. Gross, the Nestor of American Surgery, and Dr. Lewis A. Sayre, hard by, pushing a trocar through the ninth intercostal space of Vice-President Breckinridge at Lexington, Ky., to drain an abscess of the liver that was discharging a pint of pus daily through the lung. Dr. Gross complacently remarked that he made no reply to criticism, "conscious that we had done our duty."

As paradoxical as it may appear, mistakes are often a boom for the relief of suffering humanity. Perhaps some such case as Breckinridge's may have suggested to Sir Frederick Treves to go into an hepatic abscess and drain it with a tube an inch in diameter. When McGill, the father of prostatectomy, was told by his house-surgeon, Moynihan, that the microscope showed that a "tumor he had removed at the base of the bladder" was prostatic he answered, "Then why don't we always take the prostate out when it projects into the bladder?" When Sir Spencer Wells by mistake operated for an ovarian cyst and found tuberculous ascites he established the surgical treatment for peritoneal tuberculosis; and when he operated for a supposed uterine fibroid on an eighteen-year-old jaundiced girl, and

removed an enlarged spleen he cured a lifelong jaundice, and inaugurated a surgical treatment of hemolytic jaundice (Moynihan). When Lister in an old dislocation at the shoulder-joint tore the axillary artery it was a warning against the use of too great force and a brief for the open operation.

In 1877 Dr. John T. Hodgen, the ablest and most progressive surgeon in St. Louis, said to Bernays, "I have performed sixteen laparotomies and have fifteen tombstones to show for them." It would have exhausted the imagination of a Dumas to have predicted that Dr. Hodgen's assistant, Dr. W. W. Mayo, upon the pedestal of whose statue in a Rochester park is the appropriate line of Wordsworth, "A man of hope and forward looking mind," would have founded the Mayo Clinic and that his sons, those wonderful surgeons, Drs. W. J. and C. H. Mayo, who have "eyes that feel and fingers that see," would have reported, in 1925, 8147 laparotomies with a total death of 2.7 per cent. Lister made it possible.

In 1879 I saw a distinguished New York Surgeon, Dr. Alexander B. Mott, resect a hip-joint on the same table upon which Dr. J. D. Bryant had just made an anatomical demonstration. He had the courageous impudence to tell us of the insulting language that he had used in 1876 to that man of invincible patience and radiant purity, who had laid the benign hand of healing on the wounds of humanity—Joseph Lister—and we the idiocy to applaud.

In a recent letter from the venerable W. W. Keen he said, "I was Lister's first pupil in Philadelphia, on August 1, 1876, in St. Mary's Hospital, gathering all the utensils, including steam spray, to carry out exactly his methods."

Sir St. Clair Thomson in the commencement of his scholarly address, "A House-Surgeon's Memories of Joseph Lister," quotes the lines written by Robert Browning when he met a friend who had known Shelley:

And did you once see Shelley plain  
And did he stop and speak to you  
And did you speak to him again?  
How strange it seems and new.

Thomson said these lines convinced him that it was the duty of those who had the great privilege of "seeing Lister plain" to recall their personal recollections.

Joseph Lister weighed approximately 185

High Cliff  
Lyme Regis  
Dorset  
5<sup>th</sup> Mar 1895

My dear Sir

Your letter has been forwarded to this place, where I am just now staying.

I need hardly tell you that I have been much gratified by the honour you have done me in naming your son after me, and also by the

were purely because he felt that his great work for the relief of suffering humanity was progressing, that his teachings were being more and more recognized and accepted. His sympathies touched the extremes of life and were as wide as want. In the serene simplicity of his great, generous, and sympathetic soul there was no station, caste, nor prerogative, and the

very kind terms in which you refer to my teaching as it affected yourself.

Cordially wishing all happiness to you, and a life of health, goodness & usefulness to my numerous

friends,  
Very sincerely yours  
Joseph Lister

D. L. L. Hill

Letter from Joseph Lister to the author.

pounds and was six feet in height. He wore side whiskers and his hair, an iron gray, was rather long. His dress was always the same, a black Prince Albert coat and dark gray trousers, a standing collar and black cravat—"the apparel oft proclaims the man." He was modest, unobtrusive, and cared not for fame or fortune, but like Robert Burns clung to the common, everyday facts of life. When honors were thrust upon him they were received with a personal detachment, as his gratification and satisfaction

"poor man was as rich as the richest and the rich man was as poor as the poorest—Dives relinquished his riches and Lazarus his rags." Possibly the greatest shock of Lister's life came to him when he, after reprimanding a Sairey Gamp, a type of nurse immortalized by Charles Dickens, asked her if she never thought of her responsibility for all the poor sufferers under her charge and she nonchalantly replied, "Oh, I nae minds o' them."

It has been well said that "things small

within themselves oft have far-reaching significance." I received this letter from him when I named my son, Congressman Joseph Lister Hill, for him:

High Cliff  
Lymc Rcgis  
Dorset

5th March, 1895.

My dear Sir,

Your letter has been forwarded to this place, where I am just now staying. I need hardly tell you that I have been much gratified by the honor you have done me in naming your son after me, and also by the very kind terms in which you refer to my teaching as it affected yourself.

Cordially wishing all happiness to you, and a life of health, goodness and usefulness to my namesake,

I remain,

Very sincerely yours,

Joseph Lister.

Dr. L. L. Hill.

This letter was characteristic of the great man. He did not wish fame, fortune, or exalted position, but simply "a life of health, goodness and usefulness to my namesake." It told the whole story.

Sir St. Clair Thomson was Lister's house-surgeon when I was there and it was evident that he had the approbation and confidence of his Chief. He was to Lister in his hostile surroundings at King's College Hospital what Archie Butt was to Roosevelt. The nursing was done by the Sisters of St. John, an Anglican Community, who thought surgeons operating was by their sufferance, that Lister's daily visits to the hospital were unwarranted interferences, his Sunday visits sacrilegious; who thought more of the esthetic than surgical dirt, believed more in prayer without operations than operations without prayer, did everything in their power to stifle and obstruct the efficient carrying-out of the details of Lister's treatment and in a general way "with devotions' visage and pious actions sugared over the devil himself." Sir St. Clair Thomson knew how to act promptly and do things—"carry a mes-

sage to Garcia." He is the author of one of the best textbooks that has ever been written on the diseases of the nose and throat, and is the Chevalier Jackson of England. It is no wonder that he has been knighted.

Having finished my studies in New York and Philadelphia, I had a great desire to visit London and see Mr. Lister, with whose work I was familiar and whose great name was then claimed by England, but has since become a common heritage. In September, 1883, after a tempestuous voyage of fourteen days in which "Fright" did not cure "the qualms of all the luckless landmen seasick maws" I reached Liverpool. On arriving in London I matriculated at King's College and through the courtesy and kindness of Dr. John Curnow, Dean of the Medical Faculty of King's College, I was given every opportunity to attend the Surgical Hospital Practice and Surgical Clinical Lectures at King's College Hospital. King's College Hospital, which has since been moved to Camberwell, had a capacity of three hundred beds, was devoid of grounds, and was located in a thickly settled neighborhood very near the Hunterian Museum, which cost John Hunter, called the Dick Whittington of British Surgery, over \$375,000 and which since 1800 has been owned by the Royal College of Surgeons.

As I passed up the magnificent stairway and entered the operating room to hear Lister's opening lecture my eyes soon rested upon the bas-relief of Sir William Fergusson, whom Lister succeeded in 1877. I thought of his thirty-four years of active service in the hospital and of his lamentable death, of Bright's disease. I could see the great Scotchman, the most marvelous operator of his time, remove the upper jaw, lithotomize, perform his wonderful plastic work, and divide the levator palati and palatopharyngeus muscles as a preliminary to his successful staphylo-rhaphy. His wonderful delicacy of touch enabled him to become a great violinist. Like Billroth, Mikulicz, and Rokitsansky, he was a lover of all music, a worshipper

of Wagner, Beethoven, and Liszt, "of every eagle that soars in the heaven of sound." Fergusson was an uninteresting lecturer, not well informed about the works of others, and his ideas of pathology were archaic. On one occasion, while lecturing upon caries and necrosis, a student reminded him that his views differed from those of Niemeyer. Fergusson replied: "Sir, Nehemiah was a gentleman who wrote one of the books in the Old Testament, but I have yet to learn that he had views on caries and necrosis."

I thought of Sir Thomas Watson, "The Cicero of English Medical Literature," having once been a teacher here and how he electrified his classes.

Richard Partridge had previously been a surgeon of great distinction at King's College Hospital. He was one of the surgeons who went to Italy to examine Garibaldi's ankle after he was shot at the battle of Aspromonte in 1862. Partridge, unable to locate the bullet, said that none existed. But Garibaldi was not satisfied with the English surgeon's opinion and sent to Paris for Nélaton. Before starting to Italy Nélaton consulted an eminent French chemist to ascertain whether it were possible to devise an instrument which when rubbed against lead would receive the stain of the metal. The result was the famous porcelain probe, a metallic rod tipped with porcelain, which all of us had in our pocket cases before the roentgen ray. With this Nélaton located the bullet, enlarged the sinus, removed it, and this was followed by a cure with permanent ankylosis. Nélaton made a great reputation, and Partridge never recovered from his mistake.

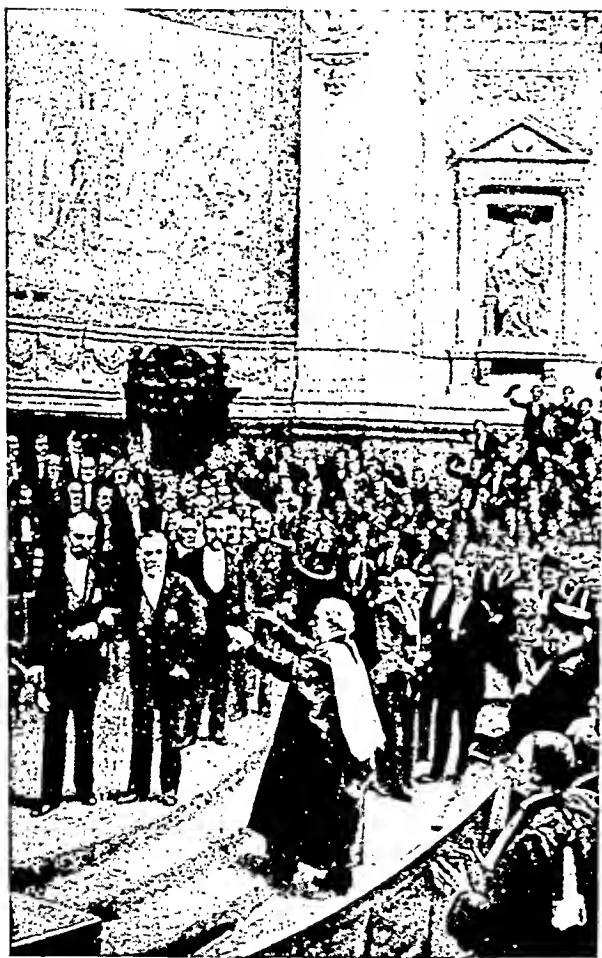
Mr. John Wood was a clinical professor of surgery at King's College Hospital when I was there. He was a powerfully built man with a distinct lameness, and a harsh and abrupt manner. He was a thorough anatomist, having once taught it, and I thought a very good operator. He had written a book on hernia and frequently did his subcutaneous wire operation for the

radical cure of inguinal hernia, the success of which depended upon getting firm union of the conjoined tendon of the internal oblique and transversalis muscles with the deep part of Poupert's ligament. The operation seemed to me blind and brutal, and could easily have been bloody where a lesser anatomist than Mr. Wood stuck the big needle into the iliac artery. Wood claimed that "Lister's fame came from Germany, that the Germans were dirty people, but that the antiseptic system was not really necessary in England." Mr. Wood wrote the article on hernia for Ashurst's "International Encyclopedia of Surgery." Mr. Wood's assistant was Mr. William Rose, who was always flashily dressed, and I thought had many of the elements of an English dude—the direct opposite of his Chief. It never occurred to me that Mr. Rose would be the first to remove the Gasserian ganglion or write a standard textbook on surgery.

When Mr. Lister appeared in the operating room he was accompanied by his assistant, Mr. Watson Cheyne, now a member of Parliament, whom he brought from Edinburgh in 1877, when he came as the successor of Sir William Fergusson. "Lions make leopards tame." In the august presence of this great man who "had divided the history of surgery into two great eras, before Lister and after Lister," I was awed into a feeling of what Benjamin Rush described as suffocated excitement. Lister was then practically in the meridian splendor of a fully developed and glorious manhood. Unlike our American professors, he took a seat. He commenced lecturing upon the aseptic and antiseptic treatment of wounds, the chart and compass of all surgical advancement. It occurred to me that I had never seen so thoughtful a face, a more kindly expression, nor a more benignant smile to mirror a great inward soul. He spoke in a conversational tone with an almost imperceptible stammer that added to the charm of his musical voice, and he had a lucidity of statement unequalled by even Mr. Erich-



sen. As an operator he was resourceful, cleanly, bold, courageous, self-possessed, but not given to rashness. He wore no operating overalls and had no rubber gloves, but his work was the signboard upon the great surgical highway that pointed to the perfection of today. He taught us avoidance of irritation by anti-



Central portion of the picture by M. Rixens representing the ceremony at the Sorbonne, December 27, 1892. Lister and Pasteur.

sepsis, for which he used oil silk protective, and the destruction with carbolic acid of the microorganisms before they reached the wound. I saw him refuse to amputate in a compound dislocation of the ankle-joint with extensive laceration, and in a compound, comminuted fracture of the leg. I remembered what the elder Gross had taught me, and I thought of what

Syme had said, and yet I saw him save both limbs. I saw him operate for knock-knee, malunited and ununited fractures, wire the patella and olecranon, excise the wrist for caries, perform an open operation for radical cure of hernia, resect the knee-joint, do a suprapubic lithotomy, and almost do a Halsted in a mammary carcinoma. In 1867 Lister performed the first of his radical breast operations upon his sister after she had been told by the most eminent London surgeons that an operation on account of the dangers of infection was absolutely unjustifiable. Lister believed that with the use of antiseptics the undertaking was warranted and having the courage of his convictions removed the breast and contents of the axilla with a part of the pectoralis major muscle. She recovered and lived for many years. Lister's heroism parallels that of our Halsted, who with his own hand, in 1881, turned the current of his own blood into a vein of an exsanguinated and apparently dying sister, and saved her. A year later he hurried to Albany, New York and at two o'clock in the morning operated upon his mother for empyema of the gall-bladder that was about to rupture, and relieved her. It all seems easy today for, as Alfred Tennyson has beautifully expressed it,

Most can raise the flowers now  
For all have got the seed.

I saw Lister use no other anesthetic than chloroform, by the open method, discovered in 1847 by one of his colleagues and one of his most unrelenting and unfair critics, Sir James Y. Simpson, who said, in 1871, "The man laid on the operating table in one of our surgical hospitals is exposed to more chances of death than the English soldier on the field of Waterloo" (Thomson). It was an American surgeon, Crawford W. Long, that five years before Simpson

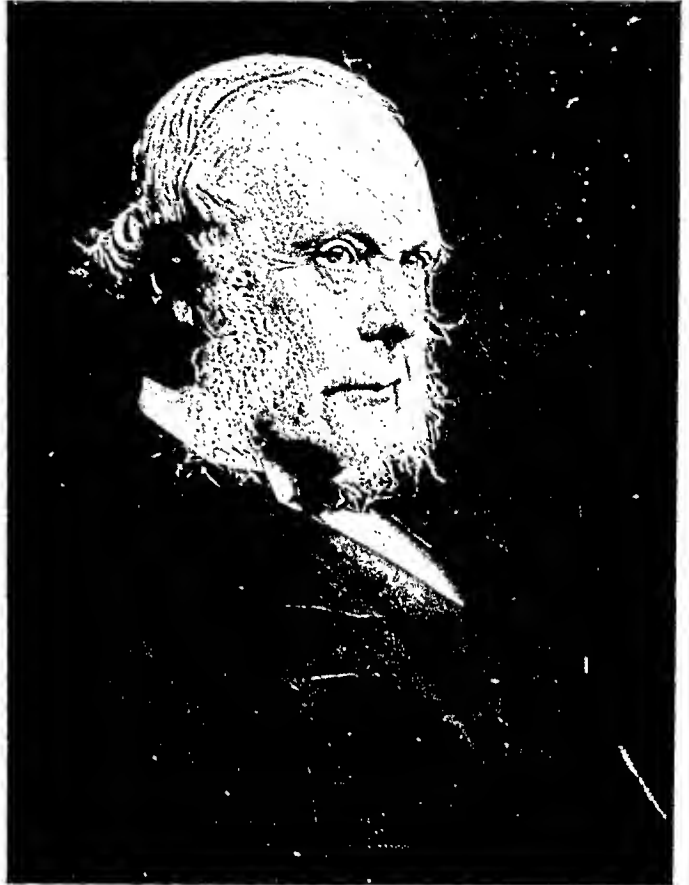
Struck from the roll of pangs one awful sum  
Made pain a dream and suffering gently dumb.

Lister used silver wire alone for suturing, for which he gave Sims credit, with a specially constructed needle. The eye of the needle was some distance from the end, and beyond the eye were grooves in which the wire fit snugly. He manifested the greatest admiration for his illustrious father-in-law, frequently during his lectures quoted Mr. Syme, and would sometimes exhibit pathological specimens that had been collected by the great surgeon. His article on amputation in Holmes's "System of Surgery" is a classic, and Lister's method of bloodless operating antedates Esmarch's bandage.

I had the honor of being one of the students that cheered him in 1883 when he returned from Windsor Castle with a baronetcy, and I rejoiced when he became a peer in 1897. Lister's pioneer work in practical surgery, which entitled him to everlasting fame, has been completely overshadowed by the enormous benefit to suffering humanity brought about by his revolution in the treatment of wounds. Lister's greatest characteristic was his conscientiousness. He refused to allow Mr. Cheyne to publish the notes of his clinic because surgeons, who did not believe in antiseptic treatment or who did not understand the technique, without the protection of which there would be loss of life or limb, would attempt to perform his new operations and to carry out his new line of treatment.

The other day at the celebration of Lister's Centenary in London Sir Berkeley Moynihan said in his masterly address: "Though Lister's earliest efforts were concerned with the abatement of existing decomposition of wound discharges, it was not long before the problem of the prevention of infection became paramount. It is beyond dispute that Lister clearly realized the distinction between the "prophylactic" and the "therapeutic" uses of chemical agents in surgery. We know now that the old quarrel as to the relative merits of the "antiseptic" and the "aseptic" methods was senseless and jejune;

for Lister was indubitably the parent of both; if indeed, there are really two methods. No surgeon ever practiced with success a method in which agents for the destruction of organisms were omitted. Aseptic surgery is the wise practice of antiseptic surgery. There is a difference in detail, not in ideal, or in fundamental truth."



Lord Lister.

Never aggressive, never palestric nor unpeaceful, but always kind and always considerate, he would say to us, "Gentlemen, I commend these facts to your candid and impartial judgment, beseeching you to form your own opinions regarding them. You are as competent as you will be to draw logical inferences from established data." Lister was unfitted and unsuited by temperament, training, and early environment for controversy; and, unlike Socrates, had no Xenophon, or to be more explicit, had no "bull dog," as Darwin had in Huxley, to attend to the needs of Spence, Simpson, and Savory. During the six

months that I saw him almost daily there was never a word nor act to cast a shadow upon his cherished memory.

By his great generalizations he has placed every organ in the body under the domain of surgical sway, made possible the wonderful clinics of the Mayos, Murphy, Deaver, Ochsner, Robert Jones, Moynihan, and others. Lord Lister relegated diseases like hospital gangrene to the past, and to victims, "oft in the morn and liquid dew of youth," listlessly looking a last good-bye to their loved ones he has given a chance, and glorified surgery. He has made civilized man his debtor, brought joy and gladness alike to the hovel of the poor and to the palace of the rich, to the Coburg of Windsor Castle and to the degraded occupant of White Chapel.

Sir Berkeley Moynihan in his Boswellian Oration, "John B. Murphy—Surgeon," referring to Lister, said, "If a man's services to humanity are the standard by which we measure his value then Lister may be counted as perhaps the greatest man the world has ever produced. He has been the means of saving more lives than all the wars of all the ages have thrown away." Who is better equipped or more competent to pass judgment upon the achievements of Joseph Lister than Berkeley Moynihan?

Sir St. Clair Thomson said, "Lister has wrought more for the relief of suffering, for the security of life, for the prevention of anxiety and for the promotion of happiness than any one man who has ever trod this earth."

Our distinguished ambassador, Thomas F. Bayard, addressing Lister at a banquet, said, "My lord, it is not a profession, it is not a nation, it is Humanity itself which with uncovered head salutes you."

Drawn and withering, for three years practically deaf and blind, Lister sat in the twilight of a life of fulfilment, "waiting for the night, waiting for the light," when on the morning of the 10th of February, 1912, at Walmer, the curtain fell upon the world's greatest tragedy, save when there

came from those pallid lips, that had never uttered any but the purest and sublimest thoughts, that heart-rending cry as they were molding on the inertia of death, "My God, My God, why has Thou forsaken me?"

When Baron Lister "left the shore touched by the mysterious sea that never yet has borne on any wave the image of a homeward sail," the great surrogate of truth and justice decreed as his legacy to his profession the magnificent achievements of the present and the marvelous possibilities of the future.

By his request he was buried with his wife at West Hampstead, although the services, with representatives from every civilized nation of the world present, were held at Westminster Abbey, where death is associated with public veneration and imperishable renown, and where the choir, as over John Hunter, proclaimed Handel's Funeral Anthem. As Sir Rickman Godlee said, "the words of the anthem, though a strange blending of texts from the Old and the New Testaments, were peculiarly applicable":

When the ear heard him, then it blessed him, and when the eye saw him it gave witness of him: he delivered the poor that cried, the fatherless, and him that had none to help him. Kindness, meekness and comfort were in his tongue. If there was any virtue, and if there was any praise, he thought on those things. His body is buried in peace, but his name liveth evermore.

In closing this altogether inadequate sketch of my venerated master I am tempted to paraphrase a beautiful apostrophe by that charming personality, "sculptor in speech, and colorist in words," Ernest Renan: "Repose in glory, noble founder, thy work is finished, the most complete immortality established. There will travel the royal road which thou hast traced ages and ages of followers."

There never was but one Joseph Lister; there never will be another.

# GASTRIC SARCOMATA

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HAVING had not long since the opportunity of operating by excision a case of authentic sarcoma of the stomach (histologically demonstrated), a few reflections on this somewhat uncommon gastric neoplasm may not be devoid of interest.

The writer will take at random three books by an American, an English and a French author, written respectively in 1913, 1916 and 1926. The first of these, George Roe Lockwood, professor in Columbia University, New York, says, "Sarcoma of the stomach is comparatively infrequent, probably not exceeding 1 per cent of gastric tumors." He then goes on to give statistics from German Universities, as usual without an intrinsic value,<sup>1</sup> but referring to Fenwick's estimate, Lockwood thinks that it is too high, "for in 1910 only 123 cases were reported and Gossett (meaning Gosset) has been able to collect but 171 cases of gastric sarcoma."

Now, in 1926, otherwise thirteen years later, Lecène and Leriche<sup>2</sup>, say (my translation): "They [sarcomata] are rare tumors when compared with gastric epitheliomata: There at present exists more than 200 instances of gastric sarcoma. It is probable that among these, there are a certain number of neurofibromata of the stomach, with an exogastric evolution, representing large growths and pseudocysts with bloody contents; these tumors which much resemble sarcomata, are in reality frequently neurinomata far less malignant

<sup>1</sup> For example, Lockwood quotes Tilger who found 1 case out of 3500 autopsies; out of 13,387 autopsies Hesch encountered 6 cases. Wilde and Gurlt, out of a total of 1263 necropsies on sarcomatous patients, compiled from the records of Munich and Berlin did not find a single case of gastric sarcoma. Such findings only distort the question and are not to be considered.

<sup>2</sup> Lecène, P., and Leriche, R. *Thérapeutique Chirurgicale*. Paris, 1926, Vol. iii.

than round-cell sarcoma or lymphosarcoma; quite a number of these [the patients] have remained perfectly well after resection of the stomach (Gosset) when more or less extensive. On the contrary, true sarcomata infiltrate the gastric walls quite completely and give rise to soft tumors or pseudocysts of large size extremely serious, and only a few cases of permanent cure have been recorded. However, Ruppert has published a case of lymphosarcoma of the stomach which was seen cured at the completion of fourteen years after total gastrectomy."

H. Norman Barnett<sup>1</sup> says: "This [sarcoma of the stomach] is not common, and when present the variety is usually spindle-celled or lymphosarcoma. The signs of the condition are very similar to those of carcinoma. Gastric dilatation, however, is not so marked, and the tumor is usually larger and may be palpated with greater ease. It occasionally happens that the spindle-celled variety grows as a polypus and can be removed locally."

Sarcoma of the stomach presents itself under several very different anatomical aspects, and, as I should attempt to show, will for this very reason set up quite desperate symptoms according to the given case. According to their seat or their size, these sarcomatous productions make themselves manifest by junctional disturbances which will incline the practitioner to a diagnosis of chronic gastritis, pyloric stenosis or ulcer or cancer of the stomach. It likewise may happen that these neoplasms give rise to no gastric symptoms and while some—on account of their small size—will be passed clinically unnoticed, others of relatively large dimen-

<sup>1</sup> Barnett, H. N. *Student's Text-Book of Surgery*. London, 1916.

sions—reaching the size of an adult head—reveal themselves in the form of an abdominal tumor which may readily be mistaken for a neoplasm of the omentum, spleen or even an ovarian cyst. Yet whatever may be the nature and origin of these neoplasms, it will only be after their clinical manifestations that the surgeon will be called upon to decide upon the opportunity of an operation. What is important for him to know is not the nature of the tumor—impossible to determine clinically—but its location and size which govern the symptomatology. For this reason it would appear that the following classification of gastric sarcomata may be fruitful:

1. Sarcomata developing toward the gastric cavity.
2. Infiltrating sarcomata.
3. Exogastric sarcomata.

Although this classification may, in some ways, be defective, it is the clearest one, as well as the most useful for the practitioner. Sarcomatous growths developing toward the gastric cavity or infiltrating the walls of the stomach may closely resemble epithelial neoplasms. Yet there exists a pathological variety, although unquestionably very rare, of gastric cancer, that of nodular growths disseminated throughout the walls of the stomach, which shall be referred to later. As to large growths, sometimes pedunculated, projecting into the abdominal cavity (extragastric development) they are absolutely special manifestations of this neoplastic process.

*Sarcoma Developing into the Gastric Cavity.* These growths project into the lumen of the stomach and are rare when compared with the relative frequency of the two other forms. Of 70 instances collected by Bertrand, 4 were of this type, 32 were of the infiltrating variety, while 31 belonged to the exogastric type. The endogastric variety are usually small neoplasms, varying in size from a lentil to a French pea; they are round and vascular. In Robert's case, however, the endogastric tumor was the size of an apple. From their seat and size these growths have been

known to interfere with the gastric functions, producing uncontrollable vomiting or symptoms of pyloric stenosis.

Two instances have been recorded by Herhold and Kemke,<sup>1</sup> where the patient vomited each meal and even blood, and soon became cachectic from want of food. In a case recorded by Prof. Cornil, a large polypus, measuring 5 cm. long by 3 cm. in breadth and pedunculated, completely obstructed the pyloric opening.

In all parts of the digestive tract, all growths developing toward the lumen of the viscus tend to become pedunculated, this resulting from the thinness of the walls, as well as the peristaltic movements which occur during digestion. Sarcomatous gastric neoplasms are no exception to this rule and their endogastric development is made easy by their pedunculization, while the movements of the stomach during digestion are more marked than in any other portion of the digestive tract.

The type of growth under consideration usually at first have a submucous development and later on project into the lumen of the stomach, pushing the mucosa before them, which, in turn, may become infiltrated with the neoplastic cells and at length undergo an ulcerative process, hence giving rise to hemorrhage, even so serious as to cause death as in Robert's case.<sup>2</sup> Here the growth was pedunculated and the size of a crab apple with an opening at its apex similar to the os uteri, leading into a cavity filled with clot from rupture of a vessel at the bottom of the cavity. The specimen was a fine example of a pedunculated plexiform sarcoma. There are several similar specimens in the Dupuytren Museum at Paris.

When these tumors are macroscopically examined, one is often surprised at their softness, sometimes even diffuent. When a cross section is made the cut surfaces look lardaceous while foci of necrosis and

<sup>1</sup> Herhold, and Kemke, *Deutsche med. Wchnschr.*, 1898; and *Mitt. a. d. Hamb. Staatskrankenanst.*, 1897.

<sup>2</sup> Robert Hémotemèse terminée par la mort due à une tumeur de l'estomac (sarcome plexiforme). *Bull. et mém. Soc. de chir. de Par.*, 1898, n.s., xxiv, 294-296.

interstitial hemorrhages are detected. This aspect of the growth will lead one to suspect its sarcomatous nature, rather than carcinoma.

*Infiltrating Gastric Sarcoma.* This type is usually prone to simulate gastric carcinoma. Two special types may be described (Lecène and Petit). The first type of infiltrating gastric sarcoma occurs as multiple nodules scattered over the entire gastric walls. The second type homogeneously infiltrates the entire extent of the gastric walls, thus simulating plastic linitis.

The first type is met with as a small nodular tumor varying in size from a millet seed to an almond invading the gastric walls. In some cases there are a large number of nodules with visceral or lymphatic metastases.

In the second type the sarcoma infiltrates the stomach walls making them feel like pasteboard. On account of this infiltration the walls become thickened to the extent of some 2 cm. and when it extends to the orifices it narrows their lumen and when the pylorus is involved signs of stenosis ensue. Then those portions of the gastric walls which are free from infiltration become distended resulting in gastric dilatation. In some instances the orifices are not involved but both curvatures and anterior and posterior walls are the seat of infiltration and so reduce the lumen of the stomach that it may not be larger than that of the normal large intestine. In some rare cases, such as described by Ewald, the entire stomach is infiltrated so that the digestive functions are completely annihilated the stomach acting as a connecting link between esophagus and intestine.

The neoplastic tissue is usually friable, tends to ulcerate and easily gives rise to hemorrhage of severe grade. The foci of ulceration leads to infection and purulent processes, sometimes followed by perforation of the stomach and peritonitis.

*Exogastric Sarcoma.* This form assumes a particular clinical aspect. The neoplasm which is more or less voluminous, peduncu-

lated or sessile, develops outside the stomach into the peritoneal cavity, and generally do not set up gastric symptoms. This is the commonest type of sarcoma of the stomach, therefore it is the most interesting to the clinician. The exogastric type is special to all connective-tissue neoplasms and we know of no case of carcinoma of the stomach developing outside of the stomach. The size of these exogastric sarcomata is relatively considerable, occasionally that of a fist, but a few have been as large as an adult head. In Bradowski's case (autopsy) the sarcoma weighed 6 kilograms. These neoplasms are usually hard yet frequently present areas of softening, cystic foci and hemorrhagic spots. Cystic formation is interesting as it explains certain diagnostic errors that have been made. The size of the cystic cavities is relatively considerable and in Tedenat's case the pockets contained 4 liters of bloody fluid. The contents may be serous or bloody. In reality they are pseudocysts resulting from foci of necrosis or hemorrhagic areas developing in the midst of the neoplasm. This is common to all sarcomatous growths in general.

These large pedunculated or sessile sarcomatous growths develop in the gastric walls, usually in the muscular stratum, dissociating its fibers and, by their vast development, project into the peritoneal cavity, pushing the serosa in front of them. It is usually on the greater or lesser curvatures that these growths arise, occasionally near the pylorus. From the very fact of their exogastric development, often near the insertion of the omentum, these neoplasms become comprised between the two omental layers, adhering to them so intimately that they have been mistaken for primary neoplasms of the omentum. When these growths arise on the greater curvature—a frequent occurrence—they tend, from their weight, to drop down and hence cause kinks in the stomach and gastric ptosis.

From what very little we know it may be said that sarcoma of the stomach usually respects the gastric orifices which,



on the contrary, carcinoma usually invades from the two curvatures and anterior and posterior gastric walls. I would especially insist upon these clinical peculiarities in the evolution of gastric sarcomata.

Whatever may be the seat or type, gastric sarcomata tend to undergo an ulcerative process, according to some in 50 per cent of the cases. This point is clinically interesting, because it explains the possibility of secondary infection of the neoplasm, followed by perforation and peritonitis. Metastases occur in the lymphatics and the various viscera, but sometimes the process in the lymphatics has been found to be purely inflammatory. Visceral metastases are far less frequent, at least in the early phases of the growth, but when they do involve organs near the stomach, they set up symptoms of primary neoplasms of these organs. I am, however, decidedly under the impression, that lymphatic metastases are not common in gastric sarcoma, any more than they are in sarcomata in general.

Gastric sarcomata are usually composed of fusiform or small round cells. The fusiform variety is formed by small, more or less elongated, protoplasmic bundles, having an oval nucleus. The round-cell variety is composed of small spherical cells with a round nucleus surrounded by a thin layer of protoplasm. In both types myeloplaxes may be present. The cell mass is freely supplied with capillary vessels which often assume a telangiectatic development; and following blood stasis with defective nutrition of the cell masses interstitial hemorrhages arise, as well as degenerative lesions hence creating foci of necrosis and pseudocysts. These growths may also be composed by polymorphous elements—a fine alveolar arrangement, fusiform cells and connective-tissue fibrils forming a fine network circumscribing masses of small round cells. Other tissues may be found giving rise to mixed tumors—fibrosarcoma, lymphosarcoma, myxosarcoma and myosarcoma. In most exogastric sarcomata the neoplastic tissue is made up

of a mixture of unstripped muscle fibers and round or fusiform cells with a large nucleus.

Sarcomata of the stomach usually arise in the submucosa and then invade the muscular stratum but usually respect the gastric mucosa and serosa.

*Symptomatology and Diagnosis.* The clinical study of sarcoma of the stomach offers difficulties due both to the infrequency of this morbid process and to the insufficient diagnostic means at present at our disposal, and perhaps above all, the frequent absence of any gastric phenomena. When symptoms do arise they have nothing characteristic and often are mistaken for those belonging to the various gastric affections met with in daily practice, as well as those pertaining to affections of abdominal viscera other than the stomach. In the first circumstance there will be signs of carcinoma or gastric stenosis; in the second there will be symptoms of an epiploic or splenic growth or even ovarian cyst. However, I shall attempt to set forth some general notions respecting the symptomatology and diagnosis which may aid the practitioner.

In the first place we may admit three clinical forms of gastric sarcoma, based upon the symptoms presented, namely: 1. the latent form; 2. an abdominal tumor with gastric phenomena simulating gastric affections such as cancer or pyloric stenosis; 3. an abdominal tumor without gastric phenomena.

The latent form of the disease is very rare, not to say exceptional. But the same cannot be said of the second form which is more frequently encountered. Here we have both objective and subjective symptoms which recall those of carcinoma of the stomach or pyloric stenosis. The patient suffers from pain in the epigastric region after meals, nausea and epigastric distention; sometimes vomiting occurs two or three hours after meals. On examination one finds a dilated stomach and occasionally a swelling in the pyloric region—all signs of pyloric occlusion.



In other cases gastric sarcoma may give rise to symptoms of carcinoma without pyloric stenosis. There is anorexia, emaciation, hematemesis and distaste for meat. By palpation an epigastric tumor and a dilated stomach are detected. There is one point, however, to be especially noted, namely the relative infrequency of hematemesis in gastric sarcoma. In a few instances these patients have presented distinct accidents of tetany which is more common in pyloric stenosis with gastric dilatation.

Sometimes the large sarcomatous tumors, to which reference has been made, set up some gastric disturbances due to dragging on the stomach and deformities of the organ thus caused. These disturbances are anorexia, slight epigastric pain, slow digestion and sometimes vomiting after meals.

From what has been said, there is no symptom which would lead to a diagnosis of the process and that of carcinoma of the stomach or pyloric stenosis has usually been made.

The third form is clinically the most frequent, and likewise the most special, of sarcoma of the stomach. It occurs as an abdominal tumor of varying size without any gastric phenomena. At the onset of their development these growths usually pass unnoticed, hence making the commencement of their evolution difficult to determine. The neoplasm at this time is a small pedunculated or sessile growth developing in the walls of the stomach outside of the gastric cavity, without any subjective sign. Attention is directed to it only when it has attained a certain size. Exogastric sarcomata will usually be palpated in the umbilical or paraumbilical regions, sometimes in the right or left hypochondrium or even in the epigastrium. These growths develop progressively until they reach a certain size—usually rapidly—without giving rise to symptoms other

than noticeable loss of weight and asthenia. Ascites has been known to develop. The clinical picture of exogastric sarcomata may be summarized as follows: an abdominal tumor usually in the umbilical region, with a rapid development without any functional visceral disturbances.

On account of the impossibility of making a positive diagnosis because of the absence of functional symptoms the following diagnostic procedures are suggested as they sometimes are valuable. If the tumor becomes mobilized after insufflation of the stomach, it is quite rational to suppose that it is connected with that viscus. If insufflation of the colon pushes the tumor toward the middle line, it is probable that the growth has developed in the omentum at its subcolonic portion, the mesentary or small intestine. If, on the other hand, colonic insufflation pushes the tumor upward to the left under the ribs, one is probably dealing with a neoplasm of the spleen.

Combined vaginal and abdominal palpation will, in many cases, show that the tumor is independent of the genital organs.

The inverted inclined position should never be neglected as it greatly facilitates ascertaining the extent of mobility of the tumor, as well as its anatomical connections. Also, if a subject under twenty-five years of age presents undoubted signs of pyloric stenosis with a perceptible tumor, the latter is far more likely to be sarcomatous than carcinomatous.

The treatment can be summed up in a few words. In the infiltrating form of sarcoma of the stomach, total gastrectomy, if feasible, should be done, otherwise a gastrojejunostomy is in order if there is enough normal gastric wall to make a good stoma.

In the pedunculated exogastric sarcomata, removal of the tumor with free excision of the portion of the gastric wall from which it develops appears to be all that is necessary.

# FRACTURES OF THE SPINE

## AN ANALYSIS OF CASES AT THE FORDHAM HOSPITAL, 1915-1925\*

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### INTRODUCTION

OF all the fractures in the skeleton those affecting the spine are the most serious. Even when the condition is recognized early it is a serious problem and difficult to treat. If rational treatment is not provided, early disability is common. In some unrecognized cases, disability may begin late and progress gradually.

There is great difficulty in diagnosis. Kleinberg<sup>1</sup> summarizes this problem as follows, "The difficulty arises from one or more of three very distinct causes: First, the lack of appreciation of the clinical symptom-complex which indicates the existence of an injury to the spine. Second, the symptoms, both subjective and objective, may be so mild that they are readily explained by some simple injury, such as a contusion or a sprain of the back. In fact, they may be so mild that the patient himself does not pay any attention to them until they have lasted for many weeks, or even months. Third, some one symptom may be so prominent as to distract attention from the spine and suggest a condition other than injury to a vertebra."

The profession has not come as yet to a definite plan of treatment, though Osgood,<sup>2</sup> writing for the American College of Surgeons' Committee on Fractures has summarized in a few concise paragraphs the general plan of treatment of crush fractures.

A great deal of the confusion is due to the lack of statistics. Many patients die

before careful examinations can be made, while others require treatments for so long a time that they tend to wander and no one physician can follow the case to a complete cure. Most of the fractures occur in industrial work, and in automobile and train accidents, thus complicating the final results through the process of litigation. It might be advisable to gather the statistics of fracture of the spine from time to time and see whether the additional data can prove of assistance in the rational treatment. Since Fordham Hospital gets many cases of spine fracture, a report on the statistics of the last ten years should prove of interest.

For the reader understanding of the subject a brief review of the symptoms and treatments seems advisable.

### ETIOLOGY

Fractures and dislocations are most common in athletes and in men whose occupations are such as to render them liable to severe injury. The injury may be either direct or indirect, the latter produced by hyperflexion or hyperextension of the spine.

The human spine is not an extremely flexible structure by itself. Motion takes place mainly at the cervical and lumbar regions. The joints of the spine are many and complicated. There are 134 joints between the base of the occiput and the sacrum, which demonstrates how even small injuries to the spinal column are likely to cause severe disability.

\* Read before the Bronx Surgical Society, January 26, 1927.

## EXAMINATION OF AN INJURY TO THE SPINE

Scudder<sup>3</sup> suggests, as an aid in the examination of the spine, answering the following four questions: What was the nature of the accident? What does palpation of the spine reveal as to the nature of the lesion? What is the level of the lesion? Is the lesion partial or complete?

## GENERAL SYMPTOMS COMMON TO FRACTURE OF THE VERTEBRAE

In fractures of the atlas and axis the patient usually dies immediately. In other regions the symptoms are shock, pain and tenderness at the level of injury, rigidity above and below the region and kyphosis at the seat of fracture especially if it is a crush fracture. If a unilateral dislocation exists, there will be lateral deformity. If the cord is injured there will be partial or complete paralysis up to the level of the lesion. The reflexes are usually absent (except in partial tear where they will be increased later on). There is sphincteric disturbance, urine retention and later on incontinence.

*Fractures of the Transverse Processes.* These are found almost exclusively in the lumbar region. Symptoms are pain in the lateral abdominal wall (flank) sometimes referred to the knee on the affected side. All movements are painful and limited, especially lateral bending. Marked tenderness is present.

*Compression Fracture or Crush Fracture of the Vertebral Bodies.* This term is used for an injury to one or more of the vertebral bodies causing an impaction of the spongy bone and a crushing together of the upper and lower surfaces. It is produced usually by forcible hyperflexion or by a force acting in the long axis of the vertebral column when the latter is in a position of slight flexion. The lower dorsal and upper lumbar vertebrae are the ones usually affected.

The anterior portion of the body is most usually affected since the force of the blow is frequently in that direction. Hence in a lateral view of the roentgeno-

gram the body is wedge-shaped. The crush may be asymmetrical, hence lateral deviation. Isolated fragments of bone may be broken off and one of these may project into the spinal canal.

Pain and deformity (angulation-kyphosis) are present at the level of the lesion. The projection of the spinous process produces the kyphosis. Motion of the spine is limited and painful. Pain is increased on pressing down on the head and shoulders in the long axis of the column. There are muscle spasm and tenderness in the region of the fracture. Pressure on the spinous process of the injured vertebrae is particularly painful. Sometimes, however symptoms are so mild that the injury escapes recognition.

*Dislocation and Fracture-dislocation of the Spine.* These usually consist of a complete bilateral dislocation of the articular facets forward, along with a fracture of one or more of the bodies of the vertebrae. The dorsal region is the one usually involved. It is a displacement of the upper portion of a vertebrae on the lower. The cord is frequently compressed between the posterior edge of the broken body below and the arch of the vertebra above. The compression of the cord is common in the dorsal region as the canal is narrow.

*Kümmell's Disease.* In some cases, after a period of improvement, there develop pain and weakness of the spine followed by neuralgic and motor disturbance of the legs. There may be a kyphosis. If untreated, these symptoms increase. These phenomena are believed to be due to a rarifying osteitis.

## ROENTGENOGRAPHY IN INJURIES OF THE SPINE

A good roentgenogram should be made in every injury of the spine, no matter how trivial it may appear. It must be taken in anteroposterior and lateral directions, and if there is evidence of some comminution, also stereoscopically. In order to get a clear roentgenogram it is necessary to empty the bowels by catharsis and ene-

mata. Kleinberg<sup>1</sup> suggests that the intestine can be displaced during the roentgenography by means of a rubber ball. This is especially valuable in roentgenographing the lumbar spine. The patient is turned on one side and a rubber ball is placed over the lateral abdominal region (flank) between the ribs and iliac crest and pressed down. The intestine will be displaced forward.

While roentgenograms should be made in each case, one must remember that the patient is dangerously ill and should not be much disturbed. It is better to delay the location of the exact site of injury for a few days than to endanger the life of the patient through the disturbance necessitated by the roentgenography. As in fractures of other parts of the body it is advisable to make roentgenograms of several regions, as there may be more than one fracture. Frequently a roentgenogram fails to show a fracture though the symptoms are very suggestive. In such cases another roentgenogram taken a few days later may show the definite lesion (see cases 5 and 6).

#### DIAGNOSIS

There are a great many cases of injury of the spine, even compression fracture, where there is absence of localized, general or referred symptoms. It is therefore of great importance to emphasize that each injured spine should be examined very carefully, neurological tests being included. Frequent re-examination should be made. Roentgenographs should, of course, be made and carefully studied.

Diagnosis of fracture of the spine should be made on (1) the history of the injury, (2) localized tenderness, (3) localized and persistent pain in the spine, (4) referred pain from nerve roots in the region of the injury, (5) weakness and deformity of the spine, (6) cord pressure symptoms, as abnormal reflexes.

#### PROGNOSIS

The prognosis depends upon the amount of injury to the spinal cord. It is less grave

that it was thought to be a few years ago. In general, the nearer the fracture approaches the medulla oblongata and the foramen magnum, the more serious is the outcome. Death is due in cervical fractures to shock and pressure upon the medulla. In upper dorsal fractures patients ordinarily die in a few days or weeks from hypostatic pneumonia. In fractures of the dorsal and lumbar regions patients die from cystitis, pyelitis and exhaustion.

As to the function of the spine itself, apart from the cord, full recovery of strength and mobility does occur, but it is not the rule. If the patient is a laborer, he will not be able to resume heavy lifting. There is some lack of flexibility. A kyphosis often occurs in the dorsal region. Cotton<sup>2</sup> says: "Prognosis in these cases, as in those with more obvious deformity, is a matter not of the lesion but of the care given. Recognized in time, properly supported, these cases do remarkably well after six months or a year. Neglected, they become and remain cripples."

#### TREATMENT

The treatment may be divided into (1) that of injuries without cord symptoms and (2) that of injuries with cord symptoms. It is also advisable to consider the mild cases where the bodies of the vertebrae are not involved. The complications have to be treated very carefully. I shall first consider the treatment in general.

*Immediate.* After an injury to the back that prevents a man from rising, he should be placed on a flat stretcher. (The position assumed after the injury should be maintained, if it does not endanger life, until the surgeon sees the case). At Fordham Hospital we are accustomed to put the patient on a Bradford frame. After examining him he should be catheterized. Accurate knowledge of the function of the kidneys will then be obtained during the first twenty-four hours.

*Direct Treatment of Cases without Paralysis.* Forceful correction (especially in dislocation or fracture-dislocation) or open

operation should be undertaken only as a last resort. Treating the bone lesion is the first essential. Immobilization of the spine with particular attention to the prevention of the increase of the kyphosis is to be done immediately. This can be carried out by fixation in the extended position. The Bradford frame, which allows the patient to lie flat on the back with hips and shoulders strapped down, answers the purpose. Opposite the kyphosis, pads of felt are applied as a corrective measure. These pressure pads are placed on either side of the spinous processes opposite the prominent vertebrae, usually the vertebra below the break. Day by day the padding can be raised without discomfort until the desired correction is reached.

In cases of dislocation of the cervical vertebrae, Taylor<sup>5</sup> advocates "reduction by controlled traction exerted on the head (with counter-traction on the lower extremities) until the spasmodically contracted cervical muscles have relaxed sufficiently to permit reduction by bimanual manipulation on the part of the operator. Fixation is maintained by a plaster jacket involving the trunk and neck, the neck portion maintaining extension of the neck by pressure upward against the occiput and inferior maxilla, and downward against the shoulders."

The method is as follows:

The patient is placed supine on a Hawley fracture table, with the trunk from the waist line upward supported on a narrow metal strip padded slightly and ending between the scapulae. A jury mast is placed so as to give traction on the patient's chin and occiput. Through its two suspension rings which lie just above the vertex of the patient's skull a double bight of clothesline is passed, and, continuing around the waist or pelvic girdle of the operator, it is tied so as to keep the patient's vertex only a short distance from the operator, who faces the patient and grasps his neck in the damaged area. Meanwhile, the lower extremities of the patient are bound to the table, or held by strong assistants, to give counter-traction. Another assistant may be necessary to keep the patient's body balanced on the narrow metal strip between his scapulae:

When everything is ready, the operator applies traction on the neck muscles, gradually and increasingly, by backing his body away while holding the neck between his two hands, thus maintaining absolute control of the whole procedure. The traction is at first exerted in the axis of that portion of the cervical spine above the injury so as to unlock the articular processes of the damaged vertebrae. After traction for a period varying with the strength and degree of spasm of the neck muscles (from five to ten minutes), the neck will be felt to elongate gradually, the bones to unlock, and then the head and upper spine are allowed to sag gently downward while still under traction until reduction is accomplished, the operator's hand assisting by propping the lower segment of the cervical spine and manipulating the upper segment gently with the thumbs, if necessary, to complete the reduction.

Reduction is indicated: (a) sometimes by the patient who feels the bones slide into place, with immediate relief of previous discomforts; (b) by a plate taken by a portable machine and developed while the patient is retained on the table (Taylor).<sup>5</sup>

Cotton<sup>4</sup> says that in some cases the predominant symptom is extreme abdominal pain. It is a sign of nerve root pressure. Occurrence of such pain is an indication for hyperextension irrespective of apparent deformity. (Hyperextension relieves nerve root pressure by opening up the foramen.)

After a few days, when the patient is out of shock, a better immobilization can be obtained by a complete plaster-of-Paris jacket. Osgood<sup>2</sup> and his school at Boston advocate a double plaster shell extending from well above the lesion, over the buttocks, to just above the knees. It must be well padded over bony prominences but closely and smoothly fitted. The patient can lie on this shell on the Bradford frame.

The patient remains in complete recumbency for eight to ten weeks. He is then allowed to try sitting up in a well-fitting jacket or brace. Gradually he is permitted to walk. The support is worn from four months to one year. (I am in favor of keeping the brace for a full year.) The process of healing, which is accomplished

by formation of bony bridges, should be followed by roentgenograms made at regular intervals. Some advocate hastening bony union by an Albee bone graft. In the opinion of many this is advisable only in the dorsal region as the graft immobilizes several vertebrae; however, the immobility is not harmful as the dorsal region has normally very little motion. In the cervical and lumbar regions, which are more mobile, it is a question whether it is not better to allow nature to stiffen only two vertebrae instead of using the graft operation which stiffens many.

#### TREATMENT OF SPINE FRACTURE WITH PARALYSIS

The advisability of laminectomy to relieve the pressure of the cord is still disputed. After the paralysis has been diagnosed as complete or incomplete, the problem arises as to whether the patient will be benefited by the operation. Some, as Cotton,<sup>4</sup> Wilson and Cochrane,<sup>5</sup> and Nicoll,<sup>7</sup> are cautious about advising the operation. Others, as Speed,<sup>6</sup> Scudder,<sup>3</sup> Krause, Estes, Elsberg, Frazier, Bottomley, Allen, McWilliams, Taylor, Miller and Coleman,<sup>9</sup> are distinctly in favor of the operation.

Of course the skilled neurosurgeon would naturally favor the operation. In the hands of the large majority of surgeons the operation is not safe and they are justified in advocating conservative treatment of the injury.

I cite here the conclusions of a few, illustrative of the general opinion. Speed says:

Primary laminectomy is undoubtedly indicated in many cases and should be done at once after painstaking examination of the patient for decision as to the character of the cord lesion. If there is a marked kyphosis which manipulation does not affect, even in the absence of cord symptoms, operation is indicated for an attempt to straighten out the column or by laminectomy to forestall the chance of compression. Nearly all surgeons who deal with these fractures favor the statement that in known complete transverse destruction of the cord, operation is

useless and may hasten death from shock or infection. Though this may be agreed upon as basic, it is not so easy to have an agreement on the symptoms which prove absolute destruction, and the few cases of suture of the cord and recovery after injury or gunshot recorded would encourage the hope that this step should be taken in the seemingly hopeless cases.

Scudder<sup>3</sup> says:

In partial lesions operation may be demanded; in fracture of the laminae and spinous processes operation is demanded; in all lesions operation may be done with the hope of doing some little good. Explore all doubtful cases. Demonstration of a "block" and roentgen ray may help to locate lesion.

Most are of the opinion that in case of complete transversal lesion with an irreparable cord, laminectomy is contraindicated.

To distinguish complete and partial lesion we quote the résumé of Scudder:

In a complete transverse lesion the history of the onset of the symptoms is a sudden one; the symptoms appear immediately following the fracturing trauma; whereas if a partial injury is present, an interval will have elapsed before the symptoms develop; the appearance of symptoms is gradual rather than sudden. In a complete transverse lesion the motor paralysis is found to be complete, and the paralyzed muscles are flaccid; whereas, if the lesion is a partial one, the motor paralysis is limited, some muscles of the limbs are paralyzed, others are not, and there is often noticed muscular spasm in the affected limbs. In a complete transverse lesion sensation is entirely gone; whereas in a partial lesion some sensation is present. The knee-jerks are variable: in the complete transverse lesion they are absent; in the partial lesion the knee-jerks are apt to be absent at first, and they return later. In the transverse lesion the paralysis of the bladder and rectum is complete; whereas in the partial lesion paralysis of these organs is not always present. Priapism, sweating, and involuntary muscular twitchings are seen more commonly in case of injury to the spine associated with complete lesions of the cord than in cases with partial lesions of the cord. In partial lesions variations from the definite types of symp-

toms are seen. The symptoms are more or less irregular.

Coleman,<sup>9</sup> making a study on determination of local compression as an indication for laminectomy, came to the following interesting conclusions:

- 1. Clinical study of patients with severe spinal cord injuries generally fails to give early information as to the extent of the cord lesion.
- 2. Laminectomy for spinal cord injuries, except in penetrating wounds, is not indicated unless there is pressure on the cord.
- 3. Pressure on the cord following fracture-dislocation cannot be demonstrated by clinical study or roentgen-ray examination unless there is considerable vertebral deformity.
- 4. Complete occlusion of the spinal subarachnoid space following injury should be taken to mean that the cord is compressed in a deformed or normal dural canal.
- 5. The demonstration of such compression of the cord by the Queckenstedt test or Ayer's combined puncture after spinal trauma should be considered an unequivocal indication for operation.

The question of laminectomy is therefore very much disputed but I do not believe that with our limited number of cases we can tip the scales one way or the other. The decision to operate rested, as in every hospital, on the personal opinion of the examining surgeon or the neurologist. Dr. Taylor, our neurological surgeon, was naturally more inclined to the operation.

To hasten ankylosis of spine some orthopedic surgeons advocate spinal bone graft.

STATISTICS OF OUR CASES

TABLE I	
NUMBER OF CASES ADMITTED	
1916.....	4
1917.....	9
1918.....	1
1919.....	4
1920.....	4
1921.....	5
1922.....	11
1923.....	7
1924.....	7
1925.....	9
Total.....	61

TABLE II

SEX		Per Cent
Male.....	47	77
Female.....	14	23

TABLE III

AGE		Per Cent
1-10.....	1	1½
10-20.....	13	21+
20-30.....	17	28
30-40.....	10	16+
40-50.....	8	13+
50-60.....	5	8+
Above.....	3	5
Unknown.....	4	6½

TABLE IV

REGION INVOLVED ACCORDING TO SYMPTOMS	
1. Cervical	
1-4.....	4
4-7.....	11
2. Dorsal	
1-10.....	2
10-12.....	2
3. Dorsal and lumbar	4
4. Lumbar.....	18
5. Sacrum.....	4
6. Transverse process	11
7. Undetermined.....	5
Total.....	61

TABLE V  
OCCUPATIONS

1. Laborer.....	11
2. Shoemaker.....	1
3. Clerk.....	4
4. Driver.....	4
5. Painter.....	2
6. Helper.....	3
7. Business and professionals.....	3
8. Students—athletes.....	4
9. Unskilled worker.....	5
10. Electrician.....	3
11. Fireman.....	1
12. Undetermined.....	20

TABLE VI

CAUSE	
1. Direct injury.....	45 (Diving—6)
2. Indirect injury.....	4
3. Unknown.....	12
Total.....	61



TABLE VII  
SYMPTOMS\*

		Per Cent
1. Without paralysis.....	23	40+
2. With paralysis.....	34	59½
3. Deformity.....	4	
4. Pain and tenderness.....	29	
5. Not definite.....	4	
6. Brought in unconscious and never re- gained consciousness.....	10	

\* Note. In many cases the symptoms could not be definitely made out. In some the histories were deficient. These notes were taken directly from the histories, without change.

TABLE VIII  
ROENTGEN-RAY FINDINGS OF SPINE

1. Crush fractures.....	3
2. Fracture-dislocation.....	6
3. Fracture.....	30
4. Fracture of transverse process alone	7
5. No abnormality found.....	1
6. No roentgenogram made*.....	14
Total.....	61

\* Many patients had no chance to have the roentgenograms made because either they were brought in unconscious or were too sick to be moved and soon died.

TABLE IX  
TREATMENTS\*

1. Operations.....	15
2. Plaster.....	15
3. Strappings.....	5
4. Bradford frame.....	1
5. No treatments.....	25
Total.....	61

\* After 1918 every patient was placed on a Bradford frame. All these treatments are understood to include the frame. The large number of "no treatments" is due to the fact that many were brought in unconscious, some died within a few days before other treatments were instituted and some were taken home against advice.

TABLE X  
RESULT\*

		Per Cent
1. Improved.....	21	34+
2. Not improved.....	1	1½
3. Died.....	25	41
4. Unknown.....	14	23
5. Result after laminectomy {		
Died.....	9	
Improved.....	5	
Transferred.....	1	

\* Most of the cases reported in Table x as operated on came in the early years of these statistics, 1915-1916. At this time spine surgery was less highly developed than now. The large number of fatalities is due to the fact that many cases were operated on which in the later years the neurologists and neurological surgeons would have hesitated to submit to such radical treatments, or would have treated conservatively.

## CONCLUSIONS

1. Every case of injury to the spine should be examined with extreme care to rule out fracture.

2. Immediate rest should be instituted until the examinations are complete.

3. If it does not endanger the patient, the roentgenogram should be made immediately. Otherwise a delay of twenty-four to forty-eight hours may be instituted.

4. Diagnosis rests on history, localized pain and stiffness of the spine.

5. If the roentgenogram is negative but the symptoms point to a fracture, another roentgenogram should be made in a few days, as it may then show the lesion.

6. Treatments: Rest on Bradford frame then plaster jacket or two plaster shells.

7. If the cord is partially injured and there are positive signs of pressure on the cord, laminectomy is to be considered.

8. If there are no positive signs of pressure on the cord, laminectomy may be advisable.

9. In complete transverse paralysis, it is doubtful whether operation will help.

10. In late cases where pain still exists, a fusion or bone graft operation for the spine should be considered.

## REPORT OF A FEW ILLUSTRATIVE CASES

No operative cases are here reported, since this paper deals strictly with the orthopedic treatments. Where operations were indicated they were done.

CASE 1. J. M., male, married, aged twenty-five was admitted July 9, 1924, with the history of having hit his head on the bottom while diving two weeks previously. He immediately lost the use of his left upper extremity and had to be dragged from the water. He had severe pain in the back of the neck and entire left arm for four days. This gradually subsided and finally disappeared. He was admitted to the hospital on account of inability to use the left upper extremity.

Physical examination showed some prominence of the fourth cervical region with slight pain, and spasm on motion of the neck. Left upper extremity completely paralyzed except

slight power in flexors and extensors of fingers. It was evident that the entire brachial plexus was involved. There was also some weakness of the left lower extremity with exaggerated reflexes. Further neurological examination showed a complete crush of the entire left side of the cord. Roentgenogram showed fracture of the fourth and fifth cervical vertebrae with posterior dislocation of the fifth.

It was decided to attempt reduction at first, then if this failed, to perform a laminectomy. On July 14, 1924, patient was put on a Bradford hyperextended frame with jury mast traction on the head. Roentgenogram ten days later showed intervertebral spaces between c4 and c5 enlarged but distinctly visible and displacement reduced; body of c4 changed in outline.

On July 31, 1924 patient was taken off the Bradford frame and a plaster collar was applied to the neck and an aeroplane splint to the arm. He was discharged in August and referred to the out-patient department for observation and massage of the hand.

On February 1, 1925, six and one-half months after the injury, he walked without a limp, and had good power in the fingers, wrist and elbow joints, but no power in the deltoid. He could not raise the arm and thus could not return to work. As the patient had to support a wife and three children it was thought advisable to arthrodesis the left shoulder. Consultations were held with several orthopedic surgeons and they all agreed to this.

The patient refused to have it done, however, and preferred to continue massage and exercises for a while. Knowing that he would not be able to return to his original occupation he began to work in a bakery.

Examination in September, 1925, showed marked improvement in the shoulder. He could raise it almost to a right angle, and rotate it inward and outward. On careful examination one could detect that a great deal of the work was done by the other shoulder muscles but the deltoid power had increased immensely. There was no deformity in the spine and no limitation of motion in the cervical region.

Examination in September, 1926, showed absolutely no defect in the deltoid. The patient is working, though he has chosen an easier occupation than before.

*Comment.* The injury in this case was extensive. By reduction and conservative

treatment he regained good power. Even the deltoid, where the return of power was delayed, has completely recovered. It is doubtful whether by an open operation he would have had a better final result.

CASE II. G. M., male, aged fifty-one, was admitted July 10, 1925, a few hours after having been struck by a street car. He was in shock and had complete paralysis of all four limbs and no control of the sphincters.

Examination showed that the lesion was in the upper cervical region and roentgenogram showed that there was a fracture of body of c5 with displacement of the fragments. The patient was put on a Bradford frame, and a jury mast with traction was applied at once. In four days he showed some power in the left upper and lower extremities. In a few days more, he began to show some improvement in the right shoulder. On July 25, 1925, he regained control of sphincters. Power in the lower extremities improved.

In October, 1925, he was taken off the Bradford frame and a Taylor brace with chin piece was applied. The patient continued to improve and could even be put in a chair. He used the left extremities better than the right. He refused to wear the brace in spite of our protest. A leather collar was made for him.

In February, 1926 (six months after the accident) he could use the head freely and fully. Power in the feet almost normal. Babinski reflex present. Ankle clonus slight. Power in the left fingers and elbow good. Left shoulder, weak power in the deltoid. Some power in the flexors of the right wrist and fingers. Could flex the right elbow. No pain in the right shoulder. Patient was put on a chair every day. Roentgenogram showed no dislocation. The interspace between c4 and c5 was markedly diminished.

February 15, 1925, began to walk with a walking table. Could put considerable weight on the foot, and on walking put weight on the heels first. Could make a few steps without the walking table. He continued to improve and on August 18, 1926 was discharged from the hospital and ordered to come to the out-patient department for treatments.

January, 1927, walked without assistance though he had slight spasticity on the right side. Dressed and undressed himself. Shaved with

ing these patients. Relief and recovery were rapid after applying jacket and collar.

CASE VI. F. S., single, aged twenty-seven, was brought to the hospital November 1, 1925 in shock. An automobile in which he was riding turned over and injured his back.

There were complete motor and sensory paralysis of both lower extremities and loss of control of bladder and rectum. The roentgenogram at that time was reported to be negative. The neurologist claimed that the injury was permanent. The patient was kept on a Bradford frame and then on an air mattress. He developed bed sores, but after a while was in a better condition to be put into a regular bed. A roentgenogram on February 16, 1926 showed that there was a fracture of the body of D12 and of the twelfth rib on the right side.

In the middle of March, 1926 a Taylor brace was applied to the back, and the patient was encouraged to sit up. On June 9, 1926 a plaster cast was applied extending from the toes to the groin with the feet at right angle and knee straight. On June 10, the patient was put up on a walking table and was able to put good weight on his feet. Braces for the feet were applied on December 18, 1926 and the patient was encouraged to walk.

Examination, January, 1927 showed marked improvement in the gait. The man could walk with slight help and put weight on heels first. Control of bladder and rectum had not returned.

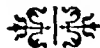
*Comment.* Although the case was so

severe as to give total paralysis and sphincteric disturbance, still the first roentgenogram showed no fracture. There is always a chance of improvement even in bad cases and it is wise to continue treatments for a long time.

*Acknowledgment.* I wish to thank Drs. Nicoll and Cunniffe, the present surgical directors of Fordham Hospital, and Drs. Taylor and McGrath, the former attending surgeons, for permission to make the studies on their cases. For the assistance of the roentgenographers, Drs. Landsman and Hirsch, I also acknowledge my indebtedness.

#### REFERENCES

1. KLEINBERG, S. Fractures of the spine. *J. Bone & Joint Surg.*, 1922, iv, No. 1, 80-104.
2. OSGOOD, R. B. Compression fracture of the spine (crush fracture). *Bull. Am. Coll. Surgeons*, 1926, x.
3. SCUDDER, C. L. *The Treatment of Fractures*. Ed. 10, Phila., 1926.
4. COTTON, F. J. *Dislocations and Joint Fractures*, Ed. 2, Phila., 1924.
5. TAYLOR, A. S. Fracture-dislocation of the neck. *Arch. Neurol. & Psychiat.*, 1924, xii, 625-639.
6. WILSON, P. D. and COCHRANE, W. A. *Fractures and Dislocations*. Phila., 1925.
7. NICOLL, A. The treatment of fractures and dislocations of the vertebrae. *Am. J. M. Sc.*, June, 1907, 869-877.
8. SPEED, K. *Fractures and Dislocations*, Phila., 1916.
9. COLEMAN, C. C. Determination of local compression as an indication for laminectomy. *J. Am. M. Ass.*, 1925, lxxxv, 1109.



following poliomyelitis have diminished. The operation has not been entirely discarded and good results can be seen at the Clinic. The Whitman astragalectomy for stabilizing the foot, at present so popular in America, is rarely, if ever, seen. Correction of deformities, tenotomy after the manner of Bayer (the so-called Z operation), and the tendon transplantation, with preference given to Biesalski's methods (transplantation of the normal tendon to the evacuated sheath of the paralyzed tendon),

residence from the institute. An infant brought to the Clinic in its mother's arms will be permitted to remain with the mother, who is taught how to execute corrective manipulation and convinced of the importance of these playful movements in the child's future welfare. In a child of four months a correction to valgo-equinus is made and a celluloid splint is prepared to hold the foot in slight overcorrection. To correct the deformity of these small feet, manual manipulation is used, under an



FIG. 1. Quadruped position following anterior poliomyelitis.

are performed as indicated. The severely crippled are improved as much as possible, educated in special schools and, if this is insufficient, cared for in asylums. In this way, Sweden has evolved a system to minimize the disaster of poliomyelitis.

#### CLUB-FOOT

Many types of club-foot with various degrees of severity are seen in great numbers, and in patients of almost every age. The value of beginning treatment early in the life of the patient is appreciated,<sup>4</sup> as are also the difficulties encountered in putting this principle into practice, and so the course of treatment adopted is modified according to the individual circumstances, particularly the distance of the patient's



FIG. 2. The same patient walking with a modified Hessing brace.

anesthesia so light that the child's cry can be heard from time to time. Special precaution is taken to prevent anterior displacement of the talus by pushing backward on the foot while correcting the equinus. Small plaster casts, made as light as possible, are applied. Care is taken to hold the correction, to bring the plaster well out under the toes, to give it a straight inner margin, and to model well over the outer side of the foot, about the ankle, and under the anterior arch. The celluloid splints are light and fit exactly.

Several times a day they are removed and the feet are massaged and gently manipulated by the mother or nurse. To combat the inward rotation of the foot and the rotation of the extremity a spiral spring is fastened between the two splints (Fig. 3). When the child has reached the age of about two years it is supplied with shoes, to which the

a resistant foot will react, after being in a cast a few weeks, to a second manipulation. The Phelps operation is resorted to, and a wedge is sometimes removed to correct a severe deformity. Patience, persistence and experience, with careful technique, bring about results that justify the methods in use (Figs. 6 and 7).



FIG. 3. Night splints for club-feet.

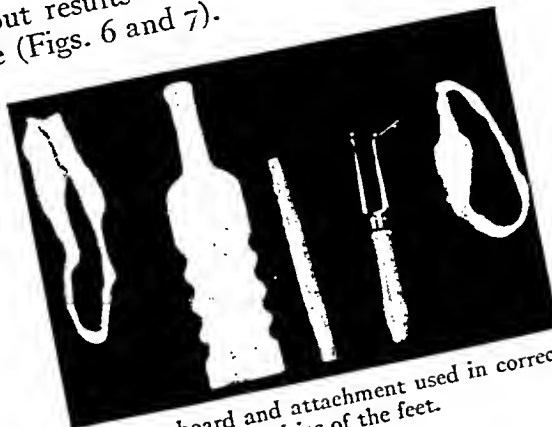


FIG. 4. Foot-board and attachment used in correcting deformities of the feet.

springs may be attached, and the outer margins of the heel and of the sole may be raised. At about two and a half years, specially built shoes with lateral irons, and at four years, light leather and steel braces are the usual choice in bringing the treatment to its completion. In spite of the desired aim to obviate absolutely every residual tendency before the treatment is discontinued, recalcitrant cases with recurring deformity are encountered. For correcting the position, especially in cases of older patients, wooden foot-boards have grown indispensable (Fig. 4). The foot is fastened to a board of proper size by means of a strong, broad sling which can be tightened by twisting with a wooden bar. The excavation of the foot, if prominent, is combated first with radical severing of the tight plantar fascia at its origin from the calcaneus and then, after the dorsum of the foot has been protected with felt, by screwing the foot down onto the board. With the aid of the handle on the board and by means of the bar, leverage can be applied in any desired direction (Fig. 5). After the varus is corrected, subcutaneous tenotomy after Bayer's method is performed, and the foot brought up to a right angle. Before an osseous operation is undertaken, the soft tissue deformity is corrected and it is astonishing to see how willingly

## SCOLIOSIS

A third group of cases, occurring in great numbers, and in the care of which good traditions have been established, due to an unusual interest in a subject with notoriously little appeal, is the group of scoliosis cases. Haglund's work<sup>7</sup> has tended to illuminate this dark subject and to improve



FIG. 5. Manipulation applied by means of foot-board.

the method of its treatment. The cases, as they present themselves, are quickly analyzed and classified. Functional scoliosis of adolescence is differentiated from the organic scoliosis which is caused by some pathologic change. Functional scoliosis attracts the greatest interest in diagnosis

as well as treatment. In this, as in every case of scoliosis, the primary point to determine is whether or not functional insufficiency is present. The insufficiency is analyzed as far as possible to determine its origin, whether the functional requirements of the spine have been increased by an excessive or eccentric load or prolonged strain, or whether the functional capacity of the spine has been decreased by diseases that soften the osseous structure or cause muscular weakness, or by a condition

is improvement; then a model is made for a leather and steel corset (Fig. 9). While the patients are still in casts, the physiotherapists teach them corrective exercises which are continued with greater ease during the corset period. The course and results of the treatment are recorded by means of photographs<sup>5</sup> taken under identical conditions, in a specially constructed frame, with the bony prominences, the interspinal line and a few lines over the bulging and sunken ribs marked on the skin. Roentgenograms



FIG. 6. Congenital club-foot in adult.

bringing about asymmetry of the vertebral column. As far as possible, the factors involved are analyzed and removed. The goal is primarily to obtain a functionally sufficient spine and the treatment consists of combining corrective and gymnastic methods and a corset. In young children the curvature is treated by means of a plaster bed. Ordinarily correction is brought about by means of a specially devised suspension frame, and after the patient has been brought into a position in which (the mobility of the lumbar spine being utilized) the curvature and rotation are diminished to the fullest extent possible, a plaster cast is applied. The casts run high over the chest (Fig. 8), are reinforced with vertical wooden ribs at the sides, and have a large window removed anteriorly. As the patient assumes his upright position natural forces tend to correct the deformity. The casts are replaced as long as there



FIG. 7. The same corrected by manipulation only.

are also made; and in this connection it is surprising to see the number of times Scheurman's disease occurs and the manifold appearance it may assume. These are, very briefly, but a few of the more striking features of scoliosis as worked out by Haglund, and the results of his comparatively simple methods of treatment are seemingly as good as can be reached with the present knowledge of scoliosis.

#### SPASTIC PARAPLEGIA

Silfverskiöld has largely contributed to the present method of treating spastic paralysis. The general status of the patient is quickly ascertained and such treatment as offers sufficient, though slight, better-

ment is instituted. The usual procedure for correcting the equinus position is to lengthen the tendo Achillis subcutaneously; but it is considered necessary to use caution in obtaining the proper amount of lengthening. The spastic limb is then put at rest with the foot at right angles, the knee extended and the hip abducted in a large plaster cast. Fixation of the extremity sometimes precedes the operation or is carried out alone, if no surgical interfer-

and gastrocnemius) show increased spasticity is the operation performed. The operation is performed, in the words of its originator, "for movements, produced by increased transmission effect of the uncrossed two-joint muscles of the leg and for other disturbances of locomotion."

### PHYSICAL THERAPY

I should like to describe the gymnastic institutes and their connection with ortho-

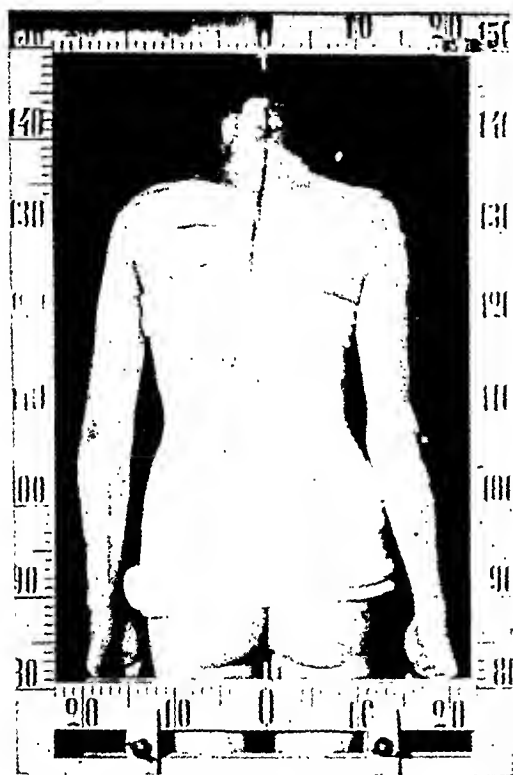


FIG. 8. Cast applied for correction of scoliosis. The graduated frame is used to facilitate identical conditions in photographic records.

ence is necessary. Form-fitting braces are then supplied and the physiotherapists, with great care, teach the patient to carry out ordinary movement properly. The operation described by Silfverskiöld has given good results in his hands. The operation has a rational basis: certain uncrossed two-joint muscles of the leg are changed into one-joint muscles by transplanting their origin. Only if these uncrossed muscles (semimembranosus, semitendinosus, rectus femoris and the long head of the biceps



FIG. 9. Leather and steel form-fitting corset used to promote function of the back.

pedics. The fame of Swedish gymnasts began with Ling, whose work was to systematize massage and exercises. His enthusiasm and efforts persuaded the state to subsidize the Royal Gymnastic Central Institute and to legalize the practice of graduates from this institute. Since then, many others have arisen claiming preferment for different methods. To curb charlatanism, a movement arose for supervision of medical gymnastics by licensed physicians, and was shared in by many of the gymnasts themselves. This demanded



an understanding of gymnastic methods by physicians, especially by orthopedists.

The Royal Central Institute clings to the Ling traditions. The system as practiced there is divided into four branches: educational, military, esthetic, and medical. The educational aspect applies primarily to public school children and is intended to place the body under the control of the will. Military gymnastics, taken up chiefly by army officers, brings an external object under the control of the will and includes fencing. Esthetic gymnastics include plastic dancing. The medical division of the system corresponds to what is generally included under physical therapy. It is carried out by thirty or forty students, mostly girls, who take a course lasting two or three years. With adeptness, exactness and specified technique, they execute the movements as outlined for them by the instructor. In the treatment of an injured wrist, for instance, it is first massaged, then a certain number of active movements without resistance and with resistance are encouraged, gentle passive movements are performed, objects of various sizes, shapes and density are grasped, and the strength of the grip is tested. The accuracy with which the movements are planned and the conscientious manner in which they are executed, contribute to the improvement.

At Arvedson's institute<sup>8</sup> there is also a large class of students doing what, to the visitor, seems like similar work. Cooperation exists here with the medical profession. Arvedson was giving a clinic to instruct the students in the diagnosis on a case referred by a physician, with the diagnosis of an old fracture of the clavicle. The examination demonstrated that the fracture was united and that the symptoms were due to subluxation of the acromioclavicular joint and to a capsular injury to the shoulder joint.

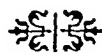
Another institute is Kellgren's.<sup>3</sup> Here it is interesting to observe how well blind students can carry on physiotherapy.

At Zander's institute,<sup>9</sup> Zander's son still carries on the original method of obtaining exercise and massage by means of mechanical devices. One cannot help but admire the mechanism of the apparatus and the ingenuity of the man who invented them. No extravagant claims were made for the method; it seemed to commend itself, particularly for patients just past middle age.

At all these institutes, good is intermingled with bad, in different proportions. The old traditions are slowly giving way to modern ideas. The orthopedists have taken what they wished from the gymnasts, and added it to their scientific knowledge. The physiotherapists receive a thorough training and then put themselves under the supervision of physicians.

#### REFERENCES

1. BAYER, C. Eine Vereinfachung der plastischen Achillotomie. *Centralbl. f. Chir.*, 1901, i, 37-38.
2. BIESALSKI. Orthopädische Operationslehre. Stuttgart, 1922, 146-153.
3. CYRIAX, E. F. The Elements of Kellgren's Manual Treatment. London, 1903.
4. HAGLUND, P. Zur Klumpfuß Behandlung im ersten Lebensjahre. *Arch. f. Orthop.*, etc., 1904-5, ii and iii, No. 7, p. 142.
5. HAGLUND, P. Meine Methode zum Photographieren der Skoliosen. *Nord. Med. arkiv. afd. 1*, 1911.
6. HAGLUND, P. Barnförämnning: Földerna och deras Behandling. Stockholm, 1913.
7. HAGLUND, P. Die Entstehung und Behandlung der Skoliosen. Berlin, 1916.
8. KLEEN, E. A. G., with contributions by Arvedson, J., Haglund, P., and Zander, E. Massage and Medical Gymnastics. N. Y., 1921, 564 pp.
9. LEVERTIN, A. SHUTZ, C., HEILGENTHAL, F., ZANDER, C. The Leading Features of Dr. G. Zander's Medio-Mechanical Gymnastics. Stockholm, 1903.
10. SILVERSKIÖLD, N. Orthopädische Studie über Hemiplegia Spastica Infantilis. *Acta Chir. Scandinav.*, Stockholm, 1924, Supplement 5, pp. 1-242.



# AN IMPROVED TECHNIQUE FOR REMOVAL OF WRINKLES OF THE FACE & NECK

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PURELY esthetic surgery aims at the restoration of cosmetic deformities and blemishes, congenital or acquired. This includes removal of wrinkles and the rejuvenation of the face, a problem that has aroused considerable interest in the medical profession as well as among the laity, notably in France. Devoting myself to cosmetic facial surgery I have developed new techniques that seem to me to furnish optimum results. These I desire now to describe to my American colleagues.

The original feature of these new techniques consists especially in carrying out extensive detachments and wide cutaneous resections, while permitting concealment of the incisions, no matter what their length, within the hair line or in the natural folds of the face.

In order to obtain the maximum correction in the treatment of wrinkles and in rejuvenation of the face with an assured durable as well as an immediate result, it is obvious that the old procedures must be abandoned. These consisted in the application of small cutaneous resections. Some of these were in the so-called "raquette" form on the temporal fossa, where the incision was concealed in the hair. Others were in the form of a crescent around the circumference of the ear, with the incision hidden in the posterior fold of the concha.

These scanty cutaneous resections undoubtedly yielded an immediate result, but personal experience and the complaints of numerous patients operated upon by other surgeons have convinced me that the corrections thus obtained were of short duration.

Conditions are altogether different with the procedures to be described here. They

have been successfully employed on numerous patients. By virtue of the new techniques, the cutaneous detachments and resections can be made on a very liberal scale, while permitting concealment of the cicatrices. The corrections are more considerable, and their results are more lasting.

Only a very brief description of these techniques is needed here, for the accompanying figures are self-explanatory.

## TECHNIQUE FOR WRINKLES OF THE CENTRAL PORTION OF THE FACE

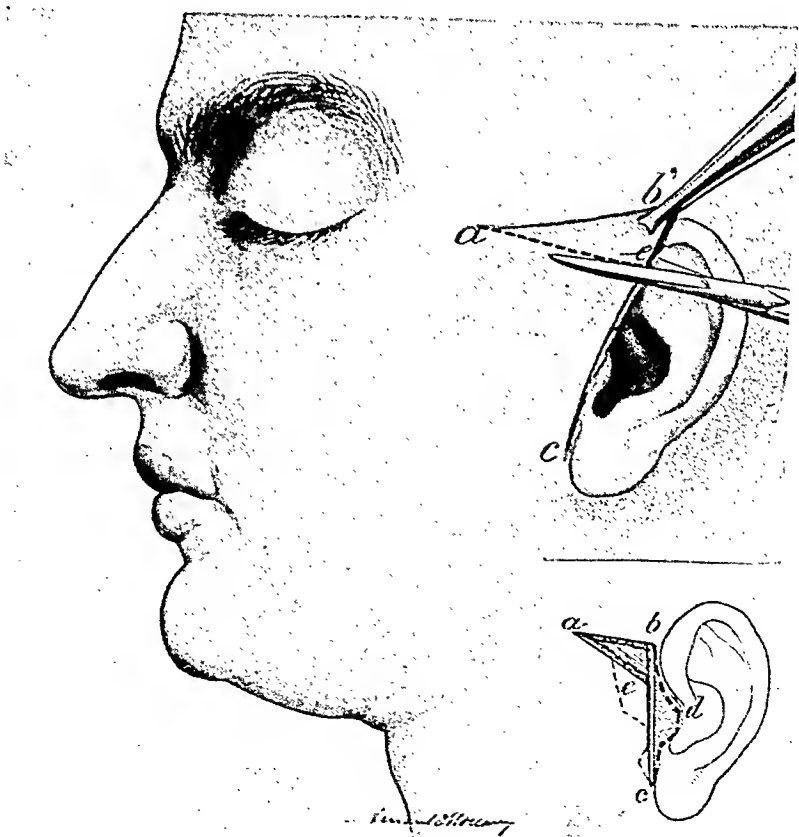
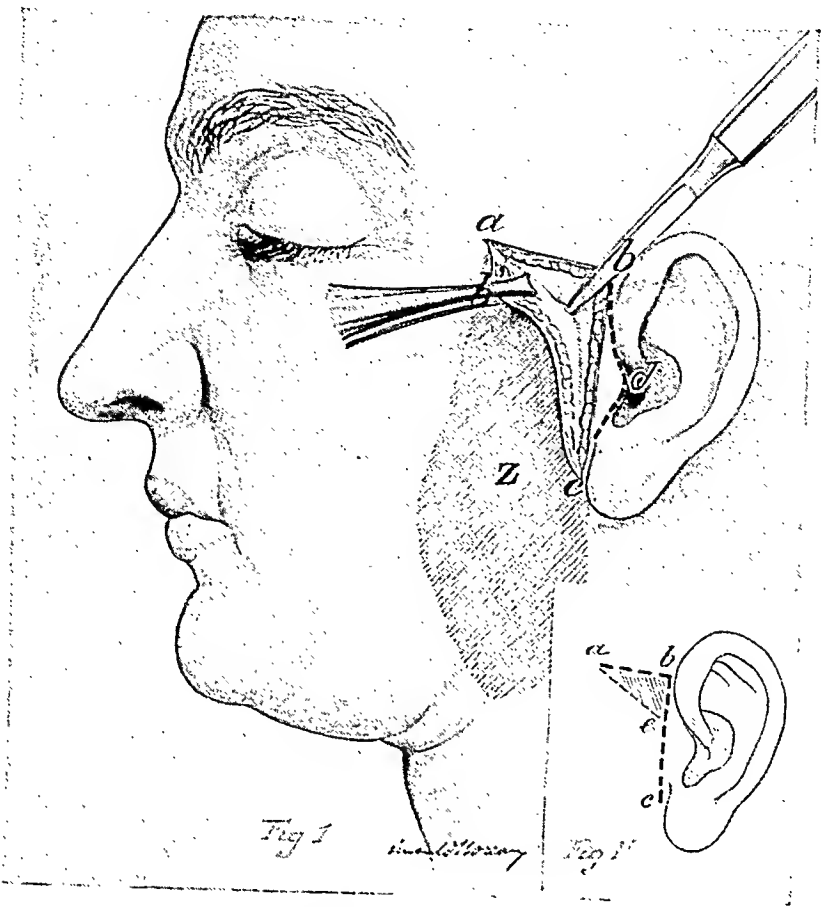
The facial defects corrected by this procedure are: wrinkles at the external angle of the eye, wrinkles and flabbiness of the lower lid, malar region, and nasolabial folds and ptosis of the cheek.

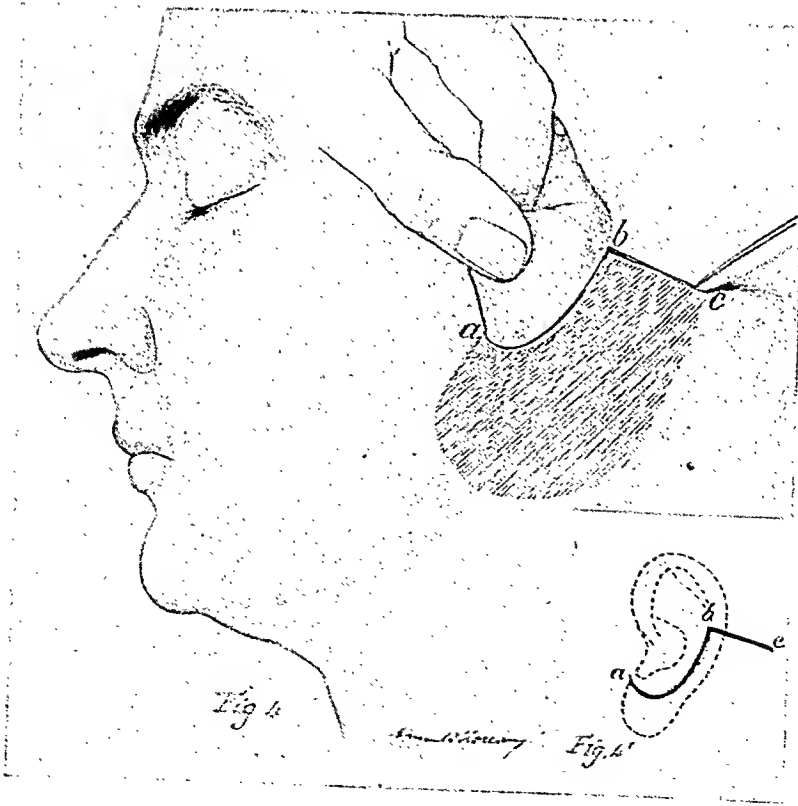
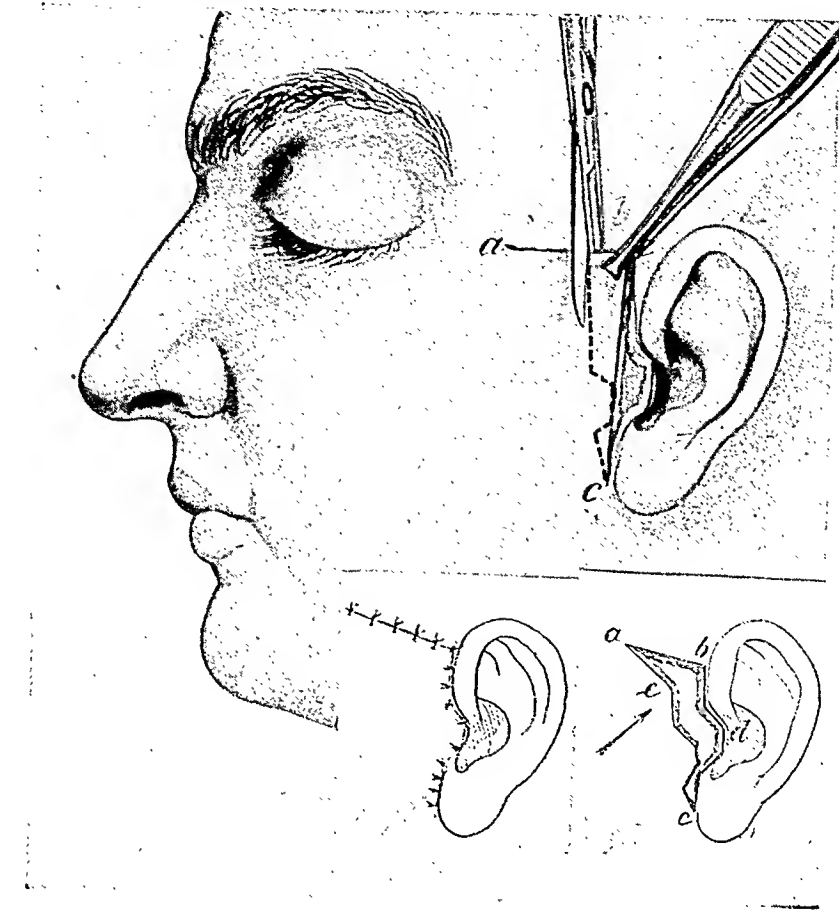
*Figure 1.* Linear anesthesia is induced along the line of incision *abc* and the crest of the tragus, *bd*. Infiltrate all the parotid and masseter region, *z*. The superior horizontal incision *ab* extends from the upper edge of the insertion of the pinna towards the outer angle of the eye, varying in length with the insertion of the hair. The line of the inferior vertical incision *bc*, makes a right angle with the horizontal incision and extends down to the insertion of the lobe.

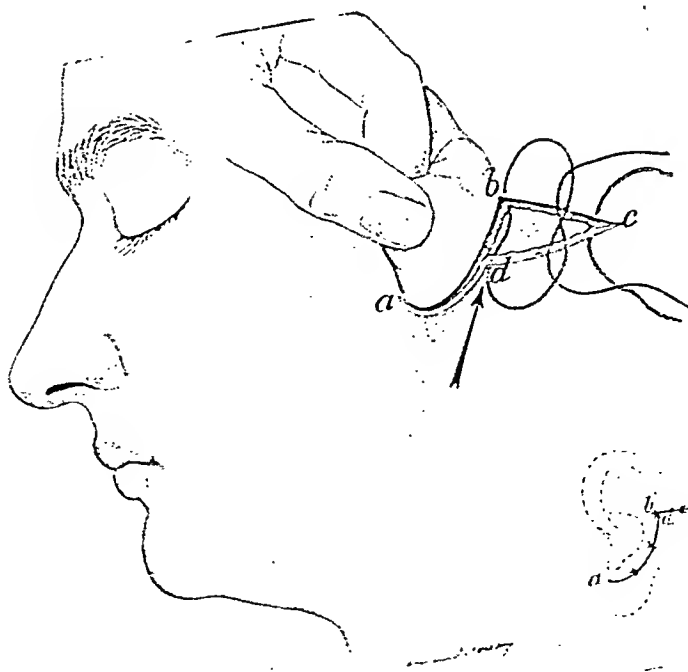
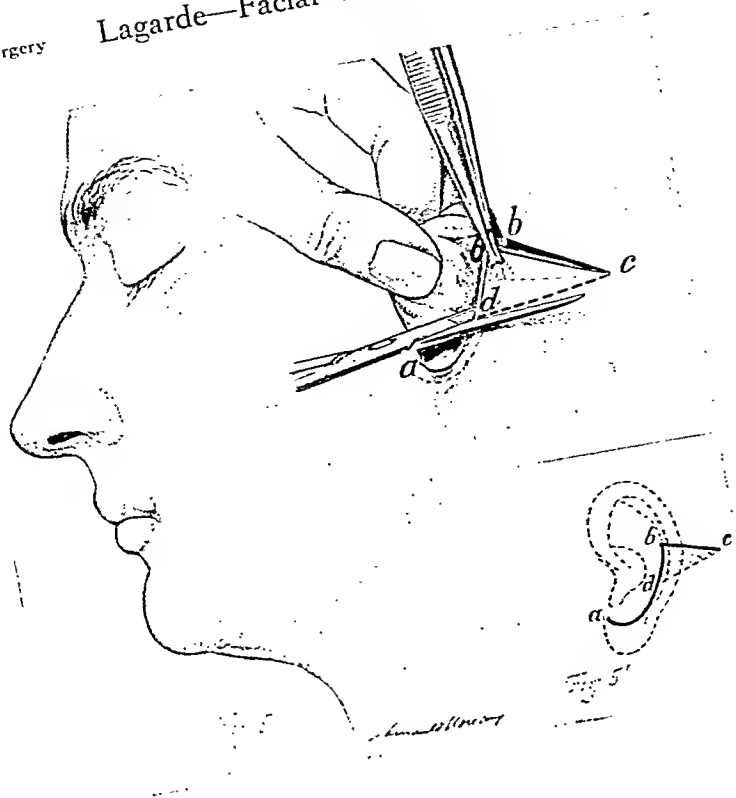
Free the cutaneous flap with scalpel or scissors. This flap should be freed in front toward the angle of the mouth for a variable distance and downward toward the cervical region. Dissect the anterior flap parallel with the skin in order to save the filaments of the facial nerve.

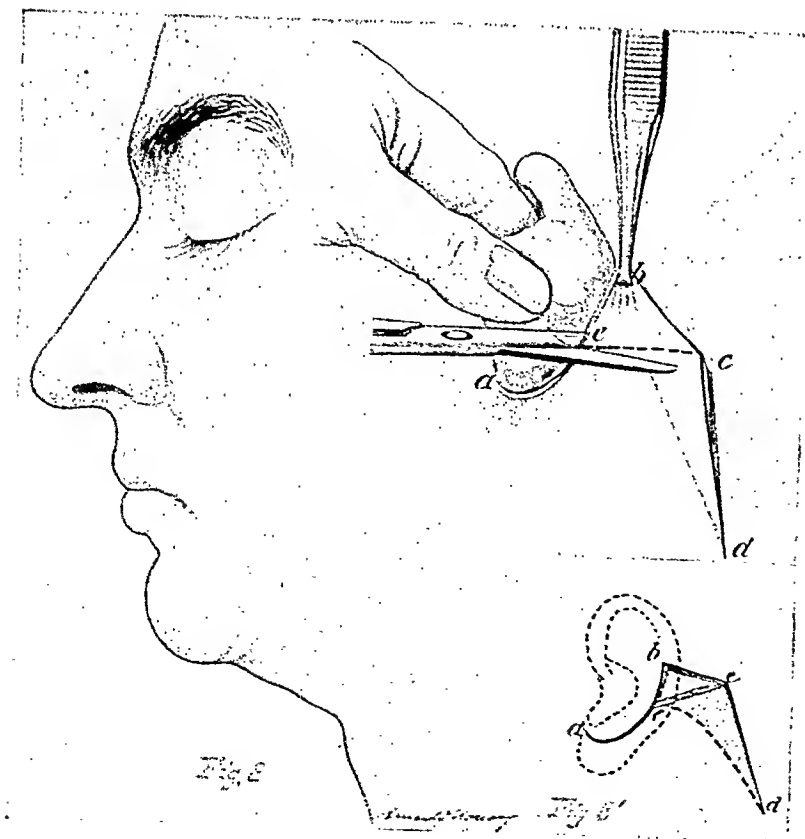
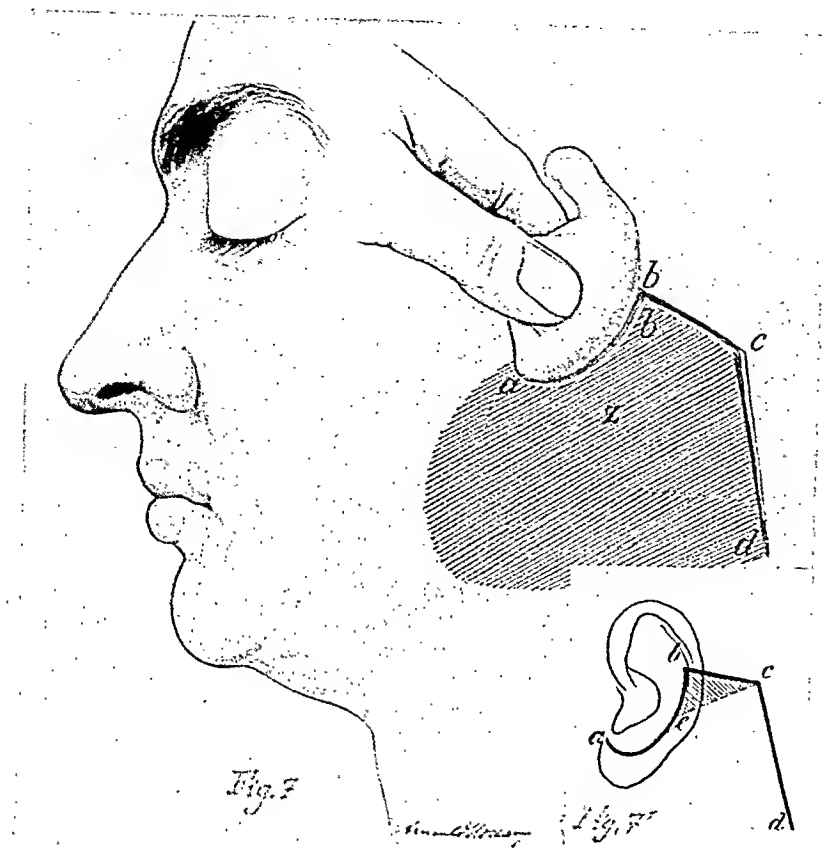
Absolute hemostasis is essential for the avoidance of hematomas.

*Figure 2.* Traction on the cutaneous flap *abc* in the direction of the insertion









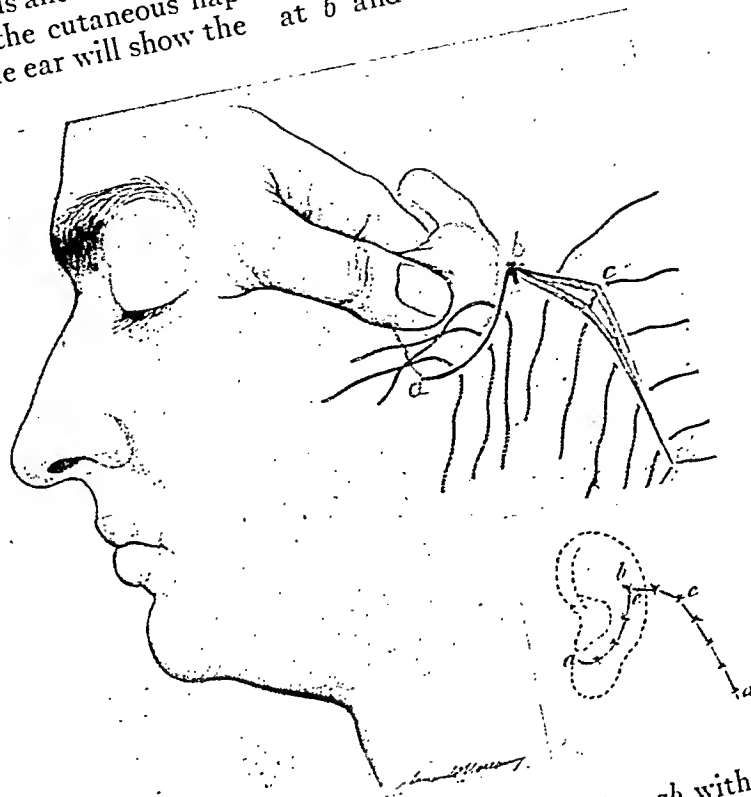
## Lagarde—Facial Wrinkles

Free all of the cutaneous flap indicated by the shading *z* with scalpel or scissors as widely as possible forwards and downwards.

Figure 8. A pull on the cutaneous flap *aebcd* upwards behind the ear will show the

with the lip *abcd* (Fig. 8'). Cut away as much as seems necessary along the curved portion *ab*.

Figure 9. First anchor a solid point at *b* and another at *c*. Then suture the



the triangular cutaneous segment *edc* which must be cut off.

After traction backwards on the remaining flap *aecd*, make a triangular resection to smooth out the furrows in the neck, to guard against puckers of the skin and to assure a perfect coaptation of the lip *aed*

curved incision *ab* with fine horsehair, the horizontal incision *bc* with medium horsehair, and the vertical incision *cd* with fine horsehair.

The result obtained when the suturing is completed is shown at *abcd* in the insert (Fig. 9').





# THE IMPORTANCE OF STRICT OPERATING ROOM CONTROL\*

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**B**ELITTLE it as we may, hide it as we will, the profession cannot close its eyes to the fact that infection in clean cases is occurring all over the country and even in the best hospitals.

In 1921, while preparing a paper for the Southern Surgical Association, I sent a questionnaire to seventy-five prominent surgeons, located in widely separated sections; and a large majority of the replies indicated the prevalence of infection in clean wounds, in most cases without known cause. Only nine reported freedom from infection; and one surgeon reported as high as 10 to 15 per cent of infection. Lack of strict control was apparent in many instances.

Since that time improvement does not seem to have taken place, infection occurring frequently in the practice of the best surgeons and in the most modern hospitals.

Infection of clean wounds is nothing short of a crime. It is a severe reflection on the surgeon, on whom the responsibility rests, and which he cannot shirk.

The ease with which fairly clean surgery can now be done, compared with the difficulties confronting the surgeons in days gone by, is so marked that the men of today do not realize the dangers to be avoided and the disastrous results that may occur at any time.

Few understand that before the days of antisepsis, hospitals were veritable nests of infection and contagion, with frightful mortality, practically every wound becoming violently infected, and frequently with erysipelas and gangrene. In obstetrics, 1 in 29 died in hospitals, usually with puer-

peral fever, while the death-rate outside was 1 in every 112 cases; 40 per cent of all amputations were fatal in hospitals, while the death-rate outside was 10 per cent.

Further, the average surgeon of today does not begin to realize the tremendous efforts that had to be made, even as late as the nineties to get good clean results.

Washing, scrubbing and the very free employment of chemical antiseptics were a necessity, in addition to the use of steam and boiling water.

Hospital construction has greatly improved in a sanitary way, and there have been many refinements in sterilizing technique, and yet our hospitals are still potential nests of infection, due to the necessity of handling dirty cases as well as clean.

Every drop of discharge from an infected wound should be caught and destroyed, whether in the operating room or in the wards, if we are to keep the hospitals reasonably clean and safe. Yet how few institutions look after this weighty matter.

Nurses should always use instruments where possible in handling such septic matter, and, when necessary, should use gloves. Their hands and clothing should never become contaminated.

Every one connected with the operating room or the hospital should be taught to fear pus, to catch and destroy it promptly.

The advent of gloves was a distinct advance in clean surgery, and yet today they offer a serious problem.

From my questionnaire, I found that nearly all the hospitals communicated with were using boiling water in sterilizing gloves (a most uncertain and unreliable

\* Read before the Hospital Standardization Conference of the American College of Surgeons in Montreal, October 26, 1926.

control. In the surgical department of each large hospital there was usually one dominant figure whose standing and influence was so strong as to enable him to direct the policy of the work, even to minor details. Take for instance Arpad Gerster, that great New York surgeon, who did so much to introduce antiseptics into America in a practical way. At Mt. Sinai Hospital, New York, he was the surgical leader, and it required his "sledge-hammer" blows to instill into the minds of doctors and nurses the vital necessity of attention to every detail of antiseptics. But by following his directions to the letter, the results even in the early nineties, when chemical antiseptics was the principal agent in combating infection, the results were well-nigh perfect. Gerster was looked upon as a martinet, but in those times he could have gotten the results in no other way. It is recorded that for thirteen months there was not a single case of infection of a clean wound in that institution.

But today, we have in each large hospital, several good surgeons, no one greatly excelling the others. No one dominates, and the operating departments practically run themselves. The careful surgeons are clean themselves, and urge their assistants to be also clean, but they can go no further. In the nature of things the operators cannot assume full responsibility for the training and watching of the operating-room staff.

Under the splendid influence and guidance of the American College of Surgeons, the staffs of the various hospitals have been well organized and are looking after laboratories, roentgen examinations and histories, but as yet have not attempted the proper and safe control of the operating room.

I strongly advocate that each staff shall select from its number an exceedingly careful surgeon and put the responsibility of the operating room on his shoulders, giving him one or more assistants if desired. He should be a man deeply imbued with

the necessity of extreme care in surgical cleanliness, and preferably an extremist in his views on the subject. He should be given full authority over the assistants and nurses of the operating department, investigating their work from time to time, instructing and conferring with them, watching each one of them with an eagle eye, and in short, personally looking after every detail of their work in the conduct of the department. His good sense and tact will readily arrange the necessary rules for both nurses and doctors. With such a man the operating room will be clean as far as it is humanly possible to make it so.

In those institutions where the staff has not full control of the operating department, they should not be content until such authority has been obtained. With the help of the American College of Surgeons and its wide influence, the change ought to be easily accomplished.

In a general hospital, open to all practitioners, the difficulty is greater. Even here those doing the principle surgical work should not be content until the essential control is secured. The problem is greater because of the fact that not infrequently incompetent and poorly trained men may operate, and influence the nurses to be negligent and inattentive. Here the man in charge of the operating room has a more difficult task, that of controlling the nurses and assistants and exercising a good influence over the careless operator. Patience, tact, and good example, as well as regular reports to the medical board, will soon straighten out these difficulties.

In operating-room control the ideal plan is for each operator to have his own operating room and personal staff of assistants and nurses. This is rarely possible except in private hospitals, where there is no earthly excuse for bad results in clean wounds.

It is to be hoped that the subject of operating-room control, including surgical cleanliness, will be taken hold of vigorously by the College in the near future.

# ANAL AND RECTAL POLYPS AS PRECANCEROUS GROWTHS

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THE interest in reporting the following cases of cancer of the rectum is that the history plainly reveals each cancer had its beginning in a polypoid growth. As I have collected 4 cases in which the history plainly tells of a benign polyp I feel that we should classify anal and rectal polyps as precancerous growths.

CASE I. (Personal file 1239. G. J. V.) Male, aged sixty-six, clerk, widower. Previous health always excellent.

*Family History.* No history of cancer as far as he knows. Three sons and two daughters, all living and in good health. Wife died at the age of fifty-six of cardiorenal disease.

*Present History.* For nine years had noticed that a small lump prolapsed with each stool but after replacing it it gave no further trouble or pain. About three months ago he noticed that the tumor no longer came out at stool. During this time he began to have the feeling of incomplete emptying of the rectum. Soon after he began to pass large amounts of mucus and to bleed. Rectal tenesmus at present is marked.

*General Examination.* Well developed and muscular, shows no anemia.

*Rectal Examination.* A hard nodular induration is felt on the posterior rectal wall, lower third. The mass shows deep crater ulceration and deep induration of the gut wall, but is still unfixed.

*Diagnosis.* Adenocarcinoma of the rectum, in second stage, and from the history only recently a benign polyp.

*Treatment.* Electrocoagulation in two stages without general or local anesthesia. The first treatment, April 19, 1926, was longer and more thorough, with two other treatments around the edges of the growth.

*Results.* Recent examination shows that patient is apparently well, with excellent scarring of the whole area.

CASE II. (Personal file 1422.) Female, aged forty-three, single, clerk.

*Family History.* Father died at sixty-three, mother died at fifty-five, both of cardiorenal disease. One maternal uncle died of cancer of the throat, at fifty-five.

*Previous History.* Except for diseases of childhood she has always had excellent health.

*Present Complaint.* Fourteen years ago she first noticed two small hard tumors prolapsing with each stool. These gave no other trouble.

About six months ago she first noticed that one of these tumors no longer came down at stool. About this time she says that she began to pass large amounts of mucus. Three months ago she had a very severe hemorrhage, and another hemorrhage recently finally decided her to brave an examination.

*General Physical Examination.* General condition excellent. She has not lost weight and shows no anemia. Blood Wassermann reaction was negative: Hemoglobin 85 per cent. Blood count normal.

*Rectal Examination.* A fixed tumor, about the size of a lemon, situated in the ampulla, posterior and slightly to the left, induration deep with nodular formation and crater ulceration. On the right side at the same level is a benign polyp with pedicle.

*Diagnosis.* Adenocarcinoma of the rectum. This growth undoubtedly was only recently a benign polyp.

*Treatment.* Electrocoagulation under gas-oxygen anesthesia, October 23, 1926. Second coagulation January 25, 1927.

*Results.* The condition on recent examination is good. Growth apparently under control. Some induration but no ulceration. Mucosa is everywhere smooth, no tenderness.

Pain in this case was controlled most successfully by the administration of colloidal gold by mouth.

CASE III. (Personal file 197.) Female, aged seventy-three, single, referred by W. W. Wilson,

Henderson, Ky., for control of the bleeding from an inoperable cancer of the rectum.

*Family History.* Negative for cancer.

*Previous History.* Always had good health, but for some years she had been troubled with a small hard tumor prolapsing at each stool. This did not annoy her otherwise.

*Present Complaint.* She recently noted that the small tumor no longer came out at stool, and that she began to pass mucus and some blood. For a week loss of blood has been very great and patient is profoundly anemic, suffering with dyspnea and fatigues easily.

*Rectal Examination.* A large nodular, deeply indurated growth on posterior bowel wall, lower third. With traction this mass can be prolapsed out of the rectum.

*Diagnosis.* Adenocarcinoma of the rectum, second stage, which from the history was only recently a benign polyp.

*Treatment.* December 14, 1922, merely to control the hemorrhage, under local anesthesia, the whole area was sutured with catgut, starting on the edges. This contracted the mass to half its size and controlled the bleeding.

*Results.* Letter from family physician said that after a stormy five days she began to improve. Patient has been examined since on two different occasions and she is apparently well. The induration can still be felt but the mucosa is smooth and she has not lost blood. The growth is evidently arrested by a very simple procedure.

CASE IV. (Personal file 533.) Mrs. L., married, aged thirty-three.

*Family History.* Mother and father both living in good health. One sister, living in good health. No history of cancer.

*Previous History.* Has not been well for past six years. Six years ago had a rectal operation for abscess and fistula. She says previous to this operation she had noticed a small tumor prolapsing at stool which she would replace. It gave no other trouble.

Two years ago she underwent an examination because of rectal discomfort and passage of large amounts of mucus. She noticed then that the tumor no longer prolapsed.

*General Physical Examination.* Profoundly anemic, and shows loss of weight. Wassermann reaction negative. Hemoglobin 70 per cent.

*Rectal Examination.* Well-defined adenocarcinoma within reach of the finger. From the history this at one time was a small benign polyp. Cancer completely encircles the bowel lumen and the induration and crater ulceration are marked. The pelvis is probably also involved.

*Biopsy Report.* (W. C. Caldwell.) Section shows adenocarcinoma in dense fibrous tissue stroma and smooth muscle. Cancer has invaded the entire thickness of the specimen and the cells in some places form typical mucous glands very similar to those of the intestine. I feel certain that we are dealing with an adenocarcinoma that probably originated in the rectum or sigmoid.

*Treatment.* Patient would not consent to colostomy. Radium treatments given by needling methods beginning December 14, 1923. Death occurred February 10, 1925, of carcinosis.

#### SUMMARY

1. Cancer of the rectum is very frequently the result of long-standing polypoid growths.

2. Diarrheas and mucous colitis call for very careful examination.

3. All rectal complaints should be investigated, digitally, at least. The discovery of a rectal or anal polyp may mean one less death from cancer of the rectum if properly treated.

4. Electrocoagulation offers a very good method of controlling cancers situated posteriorly in the ampulla and within reach of the finger. The success of the treatment depends wholly upon the stage in which one discovers the growth. In the first stage of development we can cure; in the second, we can only arrest and control loss of blood and pain. Cancers in the third stage are inoperable and cannot be cured by any known method.



# THE TECHNIQUE OF CHOLECYSTECTOMY

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SINCE cholecystectomy is the most successful operation in treating the larger number of pathological gall bladders, it is the desire of the surgeon to perfect his technique of this operation. With this end in view I have tried to study each move in the operation and to develop the system in such a way that time can be saved and efficiency gained.

I use the Bevan incision for it seems to give the easiest approach to the most complete work. When the incision is completed the dome of the gall bladder is grasped in two areas by peritoneal clips, lifted and delivered through the incision.

Two gauze packs are then placed about the area, one of which pushes the stomach, duodenum and intestinal loops down to the left. This gauze pack is anchored with a curved hemostat placed to the left of the incision. The second gauze pack is placed above to the right, thus protecting this area, and is anchored with a curved hemostat placed to the right of the incision. In this way the entire extraneous, intraabdominal field is protected from any contamination and all the parts are kept from protruding into the field of operation.

With a very sharp scalpel the gall bladder is next circumcised at a point approximately one inch from the central point of the dome and through the serous coat only. With tissue forceps this serous covering is peeled backward and downward until the cystic duct is reached. By peeling back this coat the cystic artery can be grasped in a clamp which permits a very free separation from the under side of the liver.

The cystic duct is then carefully dissected away and at its lowest point is clamped in two areas, one proximately and the other

distally. A flat sponge is then placed beneath these clamps and the cystic duct is incised in order to free the gall bladder and permit its delivery intact.

The stump of the cystic duct is then transfixed with a No. 1 chromicized catgut suture and firmly ligated on both sides of the clamp so as to effectually close this stump. The serous covering, previously deflected, is now grasped with tissue forceps and gathered up around the cystic duct stump in order to form a bag for it. This coat is then firmly tied with the loose ends of the cystic duct ligature. Following this tying these loose ends are made to encircle the cystic artery and firmly ligate the latter.

By this procedure the cystic duct stump, serous bag and cystic artery are all firmly ligated and fixed to a point beneath the under surface of the liver. When healing is completed this well-covered and protected stump becomes firmly healed to the raw surface line previously represented by the area of gall-bladder fixation to the under surface of the liver. It will also be noted that by following out this technique no raw surface is left over which post-operative adhesions may develop.

The field is carefully surveyed to detect any oozing points and the two gauze packs are then withdrawn. All parts are allowed to drop into their normal positions and it will be seen that no raw surfaces are left in view, so that the field resumes its previous aspect minus the gall bladder.

The abdominal wound is closed in the usual way. This technique permits of a speedy, accurate and yet safe operation and when systematically developed allows a comfortable convalescence.

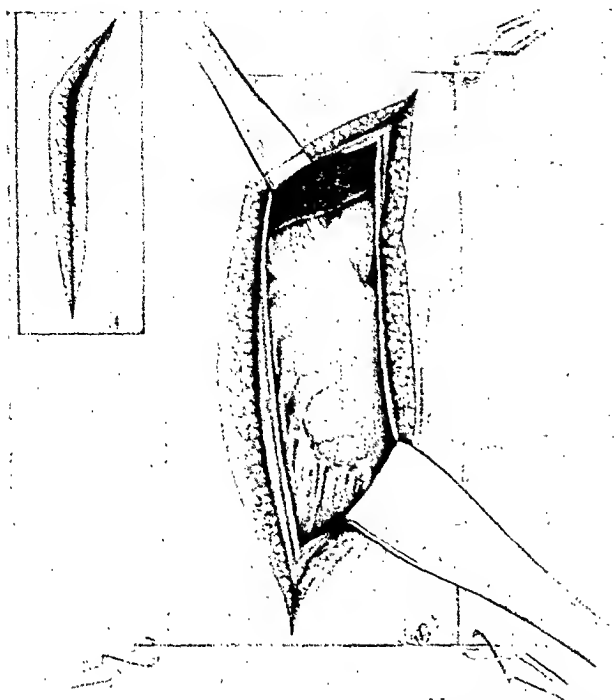


FIG. 1. Incision retracted, revealing stomach drawn over toward the liver by adhesions. Insert shows the skin incision.



FIG. 2. Stone lodged in cystic duct. Insert shows suture of cystic duct after stone has been removed. Note the packing which protects all surrounding areas.



FIG. 3. Sutures and incision in cystic duct, and all areas carefully protected by gauze packing.

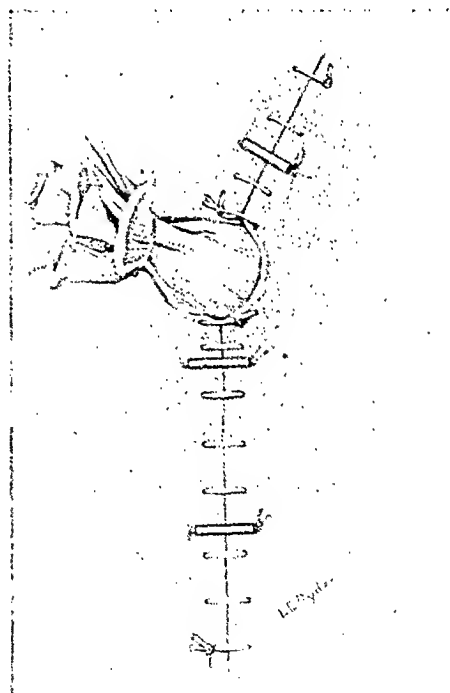


FIG. 4. Incision closed with gauze packing and drainage to the stump of the cystic duct. Packing drawn larger than normal for pronounced illustration.

# A RETRACTOR FOR GALL-BLADDER AND BILIARY SURGERY

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NO surgery is more exacting in its demand for ample exposure and precise structural visualization than that pertaining to the gall bladder and biliary ducts, especially in working at

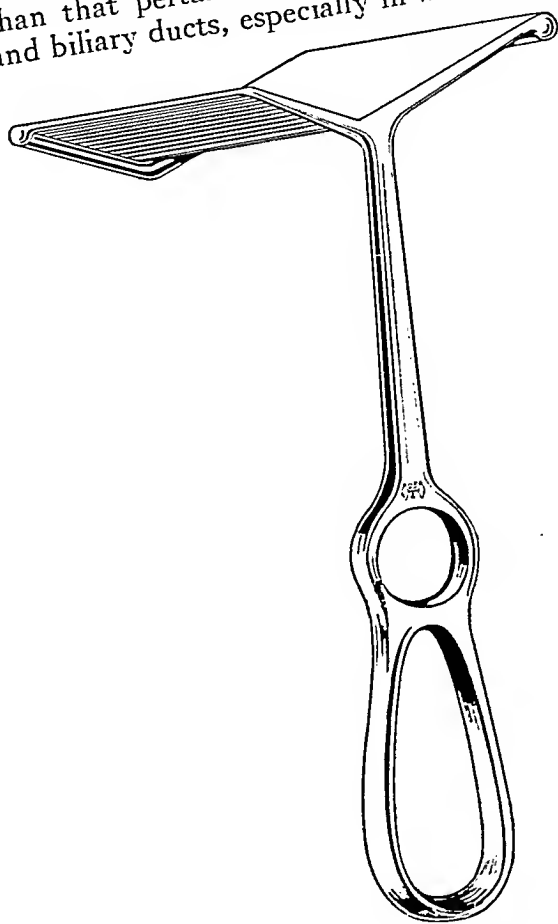


FIG. 1. Hod-shaped retractor for surgery of the biliary tract.

the junction of the cystic and common ducts (the danger angle) it is imperative to isolate and identify clearly the individual structures. False anatomical relations particularly of the cystic and common

ducts and neighboring structures and vessels, whether due to true anomalies or to distortions resulting from inflammation, are not uncommon in this region. Ill-directed clamping and cutting are fraught with gravest consequences.

Those who have contended with troublesome bleeding from the liver surface, gastrohepatic fold and adhesions, or who have encountered the sudden, brisk hemorrhage from a severed cystic artery or its branches, or who have struggled in the depths of an obese abdomen with liver and ductal structures fixed by inflammatory exudate and adhesions, will appreciate an efficient retractor.

By means of the retractor that I have developed, so adequate an exposure of the operative field is obtainable with the patient in the usual horizontal position that I have been led to discard employment of the semi-sitting or reverse Trendelenburg position.

The instrument (Fig. 1) consists of a retracting plate set at right angles to a handle. This plate is hod-shaped and angulated to  $120^\circ$ . The width of the larger portion of the plate is 2 inches, of the smaller,  $1\frac{1}{4}$  inches; and the length of each is  $4\frac{3}{4}$  inches. The entire lower edge and the lateral edge of the larger portion are heavily rodded ( $\frac{3}{8}$  inch).

The value of the angulation lies in the ample, somewhat diamond-shaped working field which the instrument forms with the under surface of the liver (Fig. 2). Because of its shape and greater width the instrument supplants the two retractors usually employed and thus frees one hand of the assistant for other service. The wider



portion of the plate prevents the intrusion of the stomach into the field while the narrower serves the same function with respect to the colon. The use of this duodenum and of the posterior parietal structures from injuries during retraction is afforded by the rodding of the edges; and by the added weight and broad surface

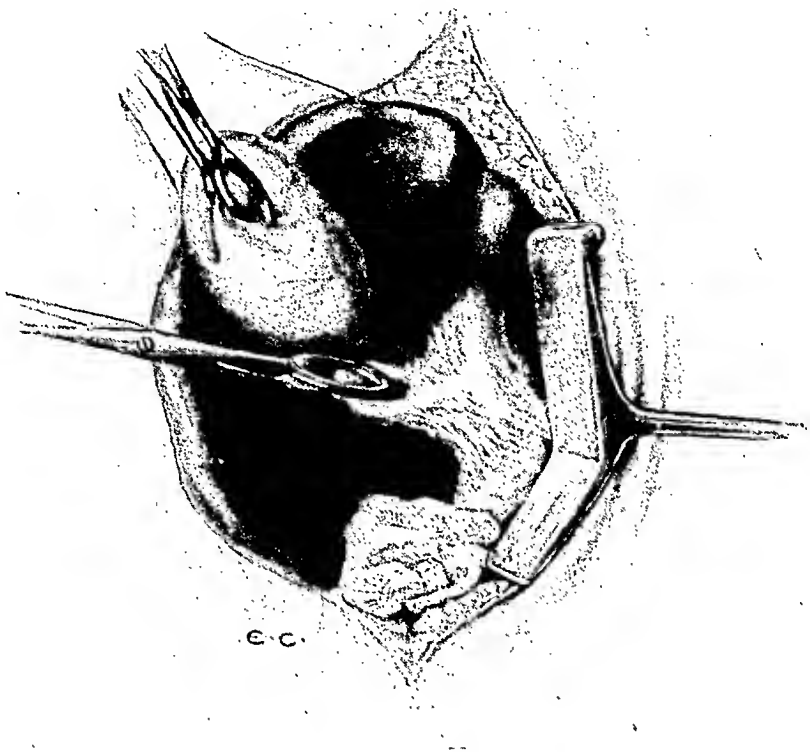


FIG. 2. The retractor in situ showing adequate exposure of structures in the diamond-shaped operative field.

instrument will decrease the number of laparotomy pads usually required and the trauma attending their use. Protection of the liver, gastrohepatic omentum and of the instrument the assistant is enabled to retract with a better perception of the relation of the blade and edges to the deeper structures.



# CALCIFIED INTERVERTEBRAL DISK

## A CASE REPORT

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A careful survey of both American and foreign literature has revealed only two cases<sup>1</sup> on the subject of calcified intervertebral disk. Calcification of a meniscus in the knee is seen occasionally in roentgenograms, but so faintly that the

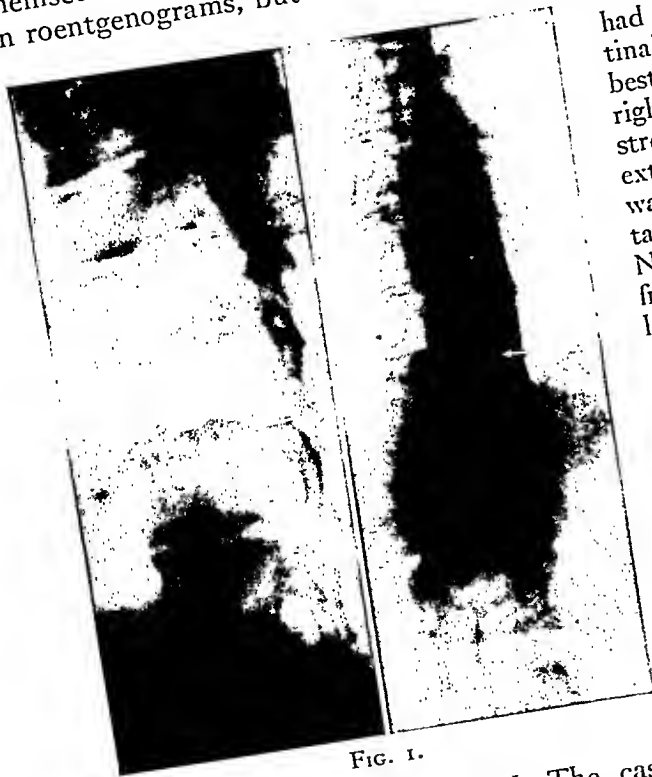


FIG. 1.

diagnosis is often questioned. The case presented here, however, is so sharp, so clear, so well defined that there can be no doubt as to the diagnosis. It is the first of its kind that I have seen, and the first seen by orthopedic colleagues in practice twenty years and more. It seems to be the first case recorded in this country.

<sup>1</sup> Barsony, T., and Polgard, F. Calcinosi intervertebralis. *Klin. Wchnschr.*, 1925, iv, 759-760.  
Bacon, A. A new disease of the spinal column. *Ztschr. f. Kinderheilk.*, 1923, civ.

Mr. R., aged fifty years, married, truckman, was referred to me with the complaint that for a year his right leg had been getting gradually weaker. Associated with this was pain in the lower back which radiated to the left. He noticed that he could not walk upstairs or downstairs except by dragging the affected leg.

He had had no other disturbance before, had no renal or cardiac defect or gastrointestinal disease, and, indeed, was always in the best of health. He had a right drop-foot, weak right Achilles and knee-jerks, and diminished strength in all the muscles in the right lower extremity as compared with the left. There was no disturbance in the pain, temperature, tactile sensibility, or deep muscle sense, etc. No atrophy of the limb was present. Frequent fibrillar contractions in the muscles of that leg were seen. Wassermann reaction negative.

A roentgenogram of the dorsolumbar spine reveals a shadow in the interspace between the tenth and eleventh dorsal vertebrae. It is in the exact location of the pulp area of the intervertebral disk. Lipping of the bodies of the vertebrae is also present.

This was discovered incidentally, has nothing to do with the clinical findings, and probably causes no discomfort.

A word about the structure of the intervertebral disk will not be amiss here. The upper and lower surfaces are firmly adherent to the thin hyaline cartilage plates on the bodies of the vertebrae. Anteriorly and posteriorly it is adherent to the anterior and posterior common ligament. Laterally, in the dorsal region, it is adherent to the interarticular ligaments. The disk itself consists of two parts—an envelope and a core. The former consists of vertical plates of fibers, one within the other and grading in structure from ordinary fibrous tissue with criss-crossing strands on the outer part to white fibrocartilage on the

inner part. The core is yellow and consists of highly elastic fibrocartilage, soft and pulpy in character with some elastic fibers running through it. It is under great tension, so much so that when the envelope is slit horizontally this core rises up above the level of the surrounding tissues.

Bridges of bone between vertebral bodies are often found. They are seen commonly in hypertrophic arthritis in the form of lipping, in typhoid spine, etc. But the lime deposition is in the fibrous extreme outer

portion of the disk and in the anterior and posterior ligaments and not at all in the fibrocartilaginous portion or the pulp area.

The sharpness of outline of the calcified area in the roentgenogram here shown, its location, its independence of any bony structure, places it in the pulp area of the intervertebral disk.

I wish to express my thanks to Drs. Arthur C. Linden, Caccio and Finkelstein for their help.



#### [SURGICAL SUGGESTIONS]

CARCINOMA in both breasts occurring simultaneously offers no hope from operation; carcinoma in both breasts developing consecutively is by no means hopeless.

COMMONLY mistaken for mammary carcinoma is a lymph gland swelling just at or beyond the upper, outer margin of the breast. This swelling—painful, tender, sometimes suppurating—is an infection of the *infero-external* portion of the thoracic chain of axillary glands. It lies over the fourth and fifth intercostal spaces at the edge of the pectoralis major and receives the lymphatic vessels of the lower lateral thoracic and upper abdominal wall. A swelling here is apt to be due to a furuncle or other infection near the waist line. The *supero-internal* portion of the thoracic, pectoral or anterior chain of axillary glands overlies the second or third intercostal space beneath the pectoralis major and receives anterior cutaneous and mammary lymphatics, and this portion is often early involved in breast cancer.

# TRANSACTIONS OF THE SECTION OF SURGERY NEW YORK ACADEMY OF MEDICINE

Meeting of March 4, 1927

THE CHAIRMAN, DR. FREDERIC W. BANCROFT, PRESIDING

## THE PRESENT-DAY APPROACH TO THE PATIENT WITH HYPERTHYROIDISM

DONALD GUTHRIE, M.D.

SAYRE, PA.

THE marked reduction in the operative mortality and in the morbidity of the surgical treatment of hyperthyroidism in the past twenty-five years has been due to a better understanding of the diseases of the thyroid gland rather than to any improved methods of technique.

Formerly, the mortality of the surgical treatment of hyperthyroidism was very high because only the most severe cases which had resisted prolonged medical treatment were given the benefit of surgery. All toxic goiter cases were considered generally in a medical light and surgery got the blame for many deaths which would have been credited to the medical side had there been a little more delay. Von Eiselsberg lost three of his first cases; C. H. Mayo lost four of his first sixteen patients; three of the next thirty-one in the next seventy-five, and four in the next two-hundred and seventy-eight. This, no doubt, was a lower mortality than that of many surgeons at that time who made so bold as to accept goiter patients for operation, but one which would not be tolerated by the laity today; for with the present understanding of the thyroid and its diseases many clinics report a mortality of less than one per cent in exophthalmic goiter cases and from one to two per cent in toxic adenoma cases.

The factors responsible for the reduction

in the mortality and the morbidity of hyperthyroidism have been the following: A better understanding of the intense waves of hyperthyroidism, and the importance of avoiding operation during these acute exacerbations.

The multiple stage operations for the bad-risk goiter patient.

The differentiation of the diseases of toxic adenoma and exophthalmic goiter.

The discovery of thyroxin.

The metabolism test as an accurate estimate of the degree of hyperthyroidism.

The use of Lugol's solution in the preparation of the exophthalmic goiter patient for operation, better anesthesia, team-play and improved methods of technique.

In 1906 when I began my work in surgery, all goiter patients, except those in extremis, were accepted for the operation of radical thyroidectomy; and postoperative hyperthyroidism at times so terrifying and so often fatal was seen at its worst. Any patient who survived a thirty-six hour session of this intoxication was thought to be safe. While postoperative hyperthyroidism still occurs, we rarely see the storm at its height as we did in those days.

Plummer in 1907 emphasized the importance of avoiding operations upon exophthalmic goiter patients during the stages of increased intoxication and urged that these patients be accepted for operation during a

relatively quiescent period. He described in detail the symptoms of the gastric crisis at this time and stated that an operation attempted during this stage, or within too short a time following it, would surely be attended with a fatal outcome.

In 1908, upon the advice of Kocher, ligations were first employed in this country by Crile, Mayo and Tinker. The bad-risk exophthalmic goiter was treated in this way, radical thyroidectomy being reserved for the less intoxicated patient. With the advent of multiple stage operations the mortality of the disease decreased but the morbidity increased.

In 1912, Plummer disassociated adenomatous goiter with hyperfunction from exophthalmic goiter believing that the former disease was due to the presence in the body of an excess of the normal thyroid product and that the latter was caused by an abnormal one.

In 1914, Kendall isolated the active principle of the thyroid gland—thyroxin, sixty-five per cent of which, by weight, is iodine. He believes it to be a dynamic catalytic agent hastening the rate of energy transformation in the body. He has found the amount of thyroxin in the tissues of a normal adult is 14 mg. and that the thyroid gland delivers approximately 0.33 mg. of thyroxin daily. The principal function of the thyroid gland is to maintain 14 mg. of thyroxin in the body and to deliver 0.33 mg. of thyroxin daily. It may be assumed that the administration of sufficient thyroxin to maintain 14 mg. of thyroxin in the body will place the thyroid at rest; 1 mg. of thyroxin elevates the basal metabolism 2.8 per cent.

To understand the modern approach to the patient with hyperthyroidism, it is important for us to review briefly an acceptable classification of goiter, to differentiate between the toxic adenoma and exophthalmic goiter, to accept Plummer's hypotheses that the peculiar symptoms of exophthalmic goiter are due to an uniodized presecretion, and to review the use of Lugol's solution in the preparation and

after-care of the exophthalmic goiter patient.

Goiter may be classified as endemic and exophthalmic; the endemic as the diffuse colloid and the adenomatous; and the adenomatous into the adenomatous with and without hyperfunction.

A relative or absolute deficiency in iodine for normal thyroid function is undoubtedly the cause of endemic goiter. This deficiency in iodine causes a sub-normal delivery of thyroxin to the tissues of the body—hypothyroidism resulting.

Diffuse colloid goiter may be congenital. It is much more common in females than in males and is seen frequently at puberty and in pregnancy due, no doubt, to the stimulation of a gland functionally damaged by an increased exhaustion of thyroxin in the body. This increased stimulation of the gland is shown by hypertrophy, a change in the secretory process in the gland, the storing of colloid in excessive amounts, increase in vascularity of the gland, great enlargement of the vessels with thrills and bruit at the poles—the hypothyroidism, by the reduction of the metabolic rate, minus ten to minus eighteen, although the true myxedema developing later in life is not connected in any way with early diffuse colloid goiter.

It is in these large diffuse colloid goiters that one sees the extraordinary action of thyroid feeding and the remarkable immediate effect of the intravenous administration of thyroxin. After the intravenous injection of a sufficient quantity to bring the metabolic rate up to normal the bruit and thrills at the poles disappear after twenty-four hours and there is a remarkable shrinkage in the size of the gland. This improvement may be continued by using enough thyroxin to maintain a normal basal metabolic rate. All symptoms will return if thyroxin is discontinued. Many of these patients may get relief if judiciously and carefully fed with the dessicated gland. With such ready control of these large goiters, a surgeon, if he realizes the immediate benefits of such therapy

## Guthrie—Hyperthyroidism

just described, rarely accepts a case of diffuse colloid goiter for operation even though the growth be substernal and causing symptoms of mechanical obstruction to respiration at the time of examination. It is always safe to place such a case under medical treatment before deciding to operate upon it, for it is most remarkable to witness the immediate shrinkage in these large masses under proper therapy.

After the age of twenty-five many of these large colloid goiters contain small adenomas which may be awakened into activity by the administration of desiccated gland, iodine or thyroxin—so that after the age of twenty-five it is safer to consider these glands in a surgical light should they cause mechanical symptoms.

## ADENOMA

It may be assumed that sustained stimulation of the thyroid gland in conjunction with unknown factors will cause the development of new tissue—new groups of acini which cannot be considered normal. Woelfer believed them to be of fetal origin. They may be noncapsulated and scattered throughout the gland (diffuse adenomatosis) or the tissue may be encapsulated (the true adenoma). In the fetal type the acini contain no colloid and the cells appear never to have functioned. In some adenomas the acini contain colloid in excess and the new tissue is called colloid adenoma. All stages of development of the acini may be found in adenomatous tissue.

The adenomatous thyroid as a rule will remain in a quiescent period for many years after its appearance but sooner or later will show signs of hyperfunction. Iodine or thyroid feeding will cause these quiescent adenomas to hyperfunction and it is this type of patient who is so frequently harmed by the incorrect use of iodine. Kocher years ago warned against the use of iodine in the treatment of endemic goiter. Endemic goiter in Switzerland is largely adenomatous and it can be readily understood why Kocher took this stand.

It is hard for a surgeon to be conservative when confronted by a young patient with a quiescent adenoma when he knows that sooner or later the adenoma will become toxic, that it may become malignant, and if it should, that it may quickly metastasize to long bones before there is much visible change in size or consistency of the tumor—that it may undergo calcareous degeneration or become substernal or intrathoracic. These are all strong arguments for the surgical removal of all quiescent adenomas, and these operations can be performed with great safety. Let me emphasize that there should be no medical treatment for the non-toxic, quiescent adenoma of the thyroid. Iodine in any form is most harmful.

## ADENOMA WITH HYPERFUNCTION

After a long period of quiescence—seventeen and six-tenth years in Plummer's last series—the majority of adenomatous goiter patients will show signs of hyperfunction. Sixty per cent of the adenomas resected recently in the Mayo Clinic in patients over sixty years of age were found to be hyperfunctioning. The onset of the hyperthyroid stage is slow and insidious in contradistinction to the rapid onset of the severe symptoms of exophthalmic goiter. The symptoms for a long time may be mild and the patient not incapacitated by them for years, but slowly and surely cardiac or renal complications will arise which will make serious inroads upon the patient and render the surgical treatment of many of these patients hazardous.

The operative mortality of the surgical treatment of toxic adenoma in the Mayo Clinic until 1925 was  $3\frac{1}{2}$  per cent. Since that time it has fallen to 1 per cent—the drop being wholly due to stopping the use of digitalis in the treatment of the patient with auricular fibrillation.

The patient with hyperfunctioning adenoma presents all the symptoms of hyperthyroidism due to an elevation of the rate of energy transformation in the body. The increased heat elimination is shown

by the increased surface temperature and perspiration, loss of weight in spite of the increased food consumption, elevation in the basal metabolic rate; cardiovascular symptoms which indicate an increase of the minute volume flow of blood from the heart, and certain symptoms due to fatigue. All these symptoms of hyperthyroidism may be produced in a normal adult by feeding desiccated thyroid gland or the administration of thyroxin.

The benefit obtained by the surgical removal of these hyperfunctioning adenomas is immediate. The metabolic rate returns to normal within three weeks and the symptoms of the hyperthyroid state disappear promptly.

The effect of iodine upon the adenomatous goiter patient already toxic is an open question. Some observers feel that it benefits the patient, others that it does harm. I have reason to believe that its use aggravates the hyperthyroid symptoms already present and I have seen not a few patients made worse by its employment. The drug should never be given to any toxic adenomatous goiter patient outside a hospital and its administration should be checked by careful chart keeping and metabolic readings.

In analyzing the symptom complex of exophthalmic goiter and differentiating it from adenoma with hyperfunction we notice first that the disease occurs at an earlier period of life, that the symptoms develop suddenly and are severe at the beginning, and the patient comes earlier for examination after the onset. In exophthalmic goiter we have besides all the symptoms of hyperthyroidism seen in adenoma, ocular changes, certain nervous phenomena and the tendency to develop crisis, coma and death, which are wholly wanting in the toxic adenomatous patient. It is these peculiar symptoms just mentioned which Plummer attributes to the presence of the abnormal uniodized presecretion.

The patient with exophthalmic goiter presents a characteristic picture of a

mechanism overdriven to the point of exhaustion. The nervous system is in a state of extreme hyper-irritability and the patient subject to the most violent emotional outbreaks. Plummer has compared the intoxication of the exophthalmic goiter to that of acute and chronic alcoholism. There is an ever present complaint of internal nervousness which expresses itself in continuous and purposeless movements. The hands are clasped and unclasped, the legs are crossed and uncrossed, the garments rearranged. The patient asks for air—fans herself violently, walks about the room impatiently; wipes her moist brow, dries her hands—unnecessary movements with no end in view. Quiet repose for even a short space of time seems impossible. When asked to step upon an examining table the whole frame of the patient trembles violently; there is such exhaustion in the severe case that the patient must be assisted upon the table.

If the intoxication is not checked and increases, the patient thrashes about in bed, sleep is impossible, an erythema develops from irritation of bed clothes. A patient in this state may be said to be on the verge of a crisis; delirium, vomiting, diarrhea, coma and death end this distressing picture in many instances.

There is a peculiar stare present which is characteristic of the disease and gives the patient a frightened, haunted appearance. The diagnosis is frequently made at a glance from this symptom alone and the exophthalmos which develops later is no doubt caused by the same factor which produces the stare.

#### LUGOL'S SOLUTION

Plummer in 1922 advocated the use of Lugol's solution in exophthalmic goiter to quiet down the storm of acute hyperthyroidism and prepare the patient for operation.

It was but a few years ago that the administration of iodine to an acutely sick exophthalmic goiter patient was strongly warned against, because it was



thought that the disease was due to an excess of the normal product of the thyroid in the body, and it was known that this product contained iodine. The use of iodine as a skin disinfectant, and of iodized catgut, was given up in many clinics. Plummer noticed, however, that the administration of a dose of thyroxin to an exophthalmic goiter patient produced no marked exaggeration of the symptoms, and because of this he reasoned that some of the typical symptoms of exophthalmic goiter, at least, must be due to an abnormal product of the gland lacking iodine. He started to administer Lugol's solution on a very definite theory: that exophthalmic goiter is due to an intensive stimulation of the thyroid under which the gland delivers not only an excess of its normal product, but the abnormal product which is an incompletely iodized thyroxin molecule—and that the symptom complex of exophthalmic goiter varies with the relative amount of the normal and the abnormal uniodized thyroxin molecule, the latter which gives rise to the characteristic eye symptoms and nervous phenomena of exophthalmic goiter and which Lugol's solution has been found to control so well. If the thyroid is well trained to this intensive stimulation, the product of the gland is essentially normal—though in excess, and postoperative deaths are rare in spite of high basal metabolic readings. If the thyroid is not well trained the stimulation produces an excess of the abnormal secretion, and postoperative deaths are common and are due to the reaction that occurs in these patients overloaded with this abnormal product.

It is most astonishing to observe the change that takes place in the condition of the acutely sick exophthalmic goiter patient after the administration of Lugol's solution for six or seven days; to witness the improvement in the nervous system of the patient as the pulse and metabolic rate fall. It is not unusual to prepare patients with a metabolic rate of well over plus sixty and a pulse rate of one

hundred and thirty or higher for a safe thyroidectomy after a week of preliminary preparation with Lugol's solution; all of whom, with the former methods of preparation would have had single or multiple ligations with single or double lobectomies performed months after the ligation, the morbidity extending over a year in some instances.

By the use of Lugol's solution the need for ligation has been greatly reduced, and the percentage of ligations has fallen from 50 to 90 per cent in some clinics. Ligations in the writer's opinion should not be entirely abandoned, but held in reserve as a safe measure for the critically sick patient and for the occasional one who does not respond to Lugol's preparation. One frequently sees a case in extremis, deep in the throes of a crisis upon admission, improve so much that operation may be performed safely at the end of two weeks. Before we used the iodine preparation, the treatment of such a case was about as successful as was the treatment of a patient in diabetic coma before we had insulin. When one can operate safely upon such cases now it is extremely difficult not to become enthusiastic over the whole subject. The reluctance which some surgeons have to administer Lugol's solution may be due to the fact that they have witnessed the harm which arises from its incorrect use, or by using it incorrectly themselves in adenomatous goiters. Lugol's solution given to exophthalmic goiter patients exactly as Plummer advises greatly reduces the mortality and morbidity of the disease. The writer considers it the most valuable contribution of the many which Plummer has made to the study of this obscure and treacherous disease.

The successful surgical management of the patient seriously ill with hyperthyroidism demands a correct understanding of the disease and the patient. It necessitates treatment in an institution which understands goiter team-play and technique, and by a surgeon and his

assistants who appreciate the value of correctly applied psychology.

Crile's anoci-association technique is a most skillful way to approach the seriously ill goiter patient and the whole plan is a tribute to his splendid genius. We apply it in a measure in our work with great satisfaction and success in that no patient knows exactly when the operation is to be performed. The night before is spent in restful sleep—morphine replacing the accustomed early sterile water hypodermic the morning of the operation. The patient goes to the anesthetizing room believing it to be the metabolism room and ethylene is administered without excitement and often without the patient's knowledge that an operation is about to be performed.

It is argued that this plan is troublesome and unnecessary—that no harm arises in bluntly announcing to the patient that an operation is scheduled for the next morning. My experience makes me believe that no matter how much the operation is desired by the patient, no matter how much she resents the delay of preparation, she cannot accept the news of an oncoming operation without intense emotional excitement.

Local anesthesia has many strong advocates—perhaps not so many as formerly, but apprehension of being hurt, the discomfort of tracheal traction which cannot be obliterated by any type of local anesthesia, the increase in the operating time which local anesthesia requires, all throw a tremendous burden on the patient. This additional cardiac load, so easily avoided by ethylene or nitrous-oxide anesthesia, may be the cause of immediate or remote cardiac breakdown, and the unpleasant experience of a thyroid operation performed under local anesthesia may leave a lasting harmful impression in the patient's mind.

All patients having hyperthyroidism should have private rooms and special nurses whether or not the patients are charity cases. The nurse must have training in the care of goiter patients. Absolute quiet must be maintained and the family

and friends must be kept away for the first few days. It is most important that the patient sleep and be kept quiet. Morphine should be given frequently. Allonal works well as an hypnotic. Fluids must be given freely with alkalies either by mouth, by bowel, or subcutaneously. We do not use digitalis preoperatively or postoperatively except for the patient with cardiac decompensation, believing that postoperative fibrillation will usually right itself in a few days in the average case. It is difficult to persuade the younger members of the staff not to give digitalis in such a case.

Iodine (Lugol's solution) should be given immediately after operation and continued during the patient's stay in the hospital and for several weeks at home. Our results have been vastly improved since we adopted this plan of treatment, and morbidity has been greatly lessened.

I agree with Crile in the management of the postoperative rise of temperature, since the rate of metabolism increases approximately ten points for every degree of temperature. Ice packs are used freely to combat it. In the postoperative care of a seriously ill goiter case the surgeon and his associates should proceed with calm assurance and gentleness in care and attention. This attitude is most valuable as a therapeutic aid during the crisis through which some of these patients must pass.

Postoperative hemorrhage, which is fortunately rare, demands the immediate and intelligent attention of the surgeon or one of his qualified assistants. If possible the patient should be transported to the operating room, but if the pressure of the clot is alarming the wound had better be opened in the patient's room, the clot expressed and the hemorrhage controlled later if thought best. The lives of five of my patients have been saved by the prompt action by members of the staff. I am satisfied that all these patients would have been lost had the usual intern staff been confronted with this urgent postoperative emergency.

Careful watching and nursing is necessary, not alone to enable one to act promptly in these emergencies which fortunately are not common, but to prevent pneumonia which is frequently seen and is so often fatal. The suggestion of Bartlett to feed these patients who have great difficulty in swallowing, by a retained nasal tube, is a very good one. A great quantity of fluids and nourishment which could not be given otherwise may be taken in this manner during the first few days after operation.

The wound should have the best of surgical attention, for not only is infection badly borne by these patients but the infection may produce enough thyroiditis with destruction of the remaining part of the gland to produce hypothyroidism.

Removal of foci of infection is advisable as soon after operation as is compatible with the patient's strength. This should be after six to eight weeks in the mild case.

If the metabolic rate has not been above plus forty, the patient is young, and the duration of the disease short, it is better not to limit activity for too long a time for fear of causing mental stress. The question is, can we further reduce the morbidity of the mild case of exophthalmic goiter as we have the mortality? Have we not been too solicitous about the young patient with no vascular, hepatic or renal damage, and have we not made chronic invalids of many of them by too strict and too lengthy a postoperative régime? Our patients have apparently done better since we have allowed them to return to partial activity soon after their arrival home. The older patient who shows the effect of prolonged and severe toxemia should, of course, have long periods of rest under strict and intelligent medical supervision.

### Discussion

DR. WILLY MEYER: I am sure that every physician and surgeon has followed with interest the evolution of the chapter on goiter in the last twenty-five to thirty years. One cannot help becoming enthusiastic in seeing the advances made, and enthusiasm is the wheel of

progress. Every medical man who works enthusiastically helps progress.

We have seen what was formerly only surmised to be the cause of goiter (deficiency of iodine in soil and water) proved definitely to be the cause. And we have witnessed how this has influenced attempts at prophylactic treatment.

Most conspicuous are the achievements of the last five or ten years: the discovery of thyroxin; the use of the basal metabolism with reference to diagnosis and prognosis; the pre-operative and postoperative use of Lugol's solution, which in many cases of exophthalmic goiter will do away with the necessity of preliminary ligation of the thyroid arteries; a practical classification of goiter, etc. All of this means tremendous progress of which we may well be proud and enthusiastic.

Naturally, operative technique in goiter operations has greatly advanced. Years ago it was the late Theodor Kocher, chief of the Surgical Clinic of Bern, the originator of the modern technique in operations for goiter, who, on basis of his unlimited material, urged the use of local and regional anesthesia in the surgery of the thyroid gland. He never omitted testing during the operation whether the inferior laryngeal nerve had remained uninjured. Having observed in my own cases and in those of a number of my colleagues the great excitement, even death, of some of the patients afflicted with exophthalmic goiter during operation under local anesthesia and even before the operation had begun, I have often thought that a still safer method might be found in colonic anesthesia, when the patient is brought under the influence of the anesthetic in his own room and while unconscious is carried to the operating room, thus escaping the excitement common under other forms of anesthesia.

I have learned a great deal from the excellent paper of Dr. Guthrie.

DR. ALEXIS V. MOSCHCOWITZ: Like Dr. Willy Meyer, I also have learned a great deal from the paper of Dr. Guthrie. My only regret is that Dr. Guthrie read this paper before an association of surgeons and not one of general practitioners, because a majority of the surgeons are in accord with what he has said. While there is considerable improvement in New York City at the present time, there still appears to be some diffidence in referring goiter patients to the surgeon for operation. It is only a few years since I paid repeated visits to the out-patient department of Mt. Sinai

Hospital and I found that almost every department except one was treating goiter cases, and surprisingly the exception was the surgical department.

I differ somewhat with Dr. Guthrie in his closing statement, namely, that patients require very definite instructions following discharge after operation. I have purposely made it a rule to give these patients no directions whatsoever and have found in a careful follow-up that they are just as well and perhaps better without any directions. Some of the patients do brilliantly after thyroidectomy, others do not do as well because they retain quite a series of residual symptoms. I believe this is due to the fact that operation has been delayed too long and that whatever does the damage in a case of Graves' disease has done by that time irreparable harm. I mention this merely because I am of the firm opinion that cases of Graves' disease should be operated upon early, before permanent damage has been done.

As for the important question of iodine therapy, I would like to emphasize that I look upon it as the greatest advance in the treatment of Graves' disease and yet it is to be greatly regretted that this boon to therapy has been so freely given out by the Mayo Clinic. I state this advisedly because ever since the publication of this method of therapy, almost every case of any swelling of the neck is treated *ad libitum* with iodine without any good resulting and, I may add, with some harm. It is well to emphasize at this point that the iodine should be used as a preoperative measure.

There is also a slight difference of opinion regarding the question of toxic adenoma. I personally have found that all cases of adenoma which present toxic symptoms also present sufficient evidence in the thyroid gland besides adenomata, namely, hyperplasia. In addition, it has also been my experience that these cases stand the administration of iodine just as well as the non-adenomatous cases of Graves' disease. This has been my opinion for a number of years and I am very glad that Graham and Cutler of Cleveland agree with me in their most recent publications.

DR. WILLIAM BARCLAY PARSONS: I would like to express my agreement with Dr. Guthrie and disagreement with Dr. Moschowitz as to the differentiation between toxic adenoma and exophthalmic goiter. It seems to me that these two groups of cases are separate and distinct. In toxic adenoma there are either single or

many masses, the symptoms are slow in developing, and the history is continuous, with gradually increasing severity. These cases do not develop eye signs or gastric symptoms. Now and again one sees a case where an adenoma has been under observation in which the symptoms of exophthalmic goiter appear. The pathologic picture in the gland tissue is usually a characteristic one. In cases of toxic adenoma where the symptoms have not been so severe one does not find in the surrounding glands this characteristic picture.

Beginning last fall, after the publication of Graham and Cutler's paper, we gave to our toxic adenoma cases courses of therapy with Lugol's solution. In some there was no improvement; in another group the symptoms became aggravated and the metabolism lower, whereupon we stopped the Lugol's solution and, in a few, definite improvement occurred. In the exophthalmic group there was enormous and regular improvement under iodine therapy which was very different from the results of treatment in the adenoma group. Jackson speaks of twenty-one as the critical age in which one seems to get satisfactory results with the use of iodine in colloid goiter. He feels that in older individuals this cannot be done. I have that feeling. At first I treated all the individuals with iodine and where I did not get unsatisfactory results I got no results, as far as reduction of mass is concerned. It is quite satisfactory in younger individuals, but in those over twenty-one or so I believe there is real danger of changing a non-toxic into a toxic adenoma. As most of these are multiple adenomata in the colloid stage, and not simple colloid goiter, iodine therapy cannot be expected to help, and it may do harm.

DR. CHARLES GORDON HEYD: Most of us have read in the last few years considerable about the goiter problem and its treatment but it is seldom that one finds himself so completely in accord with the essayist as on this occasion. There are a number of points that deserve attention. I think that we will all agree that the measure of a cure after thyroid resection in cases of hyperthyroidism is dependent upon the length of time that the patient has suffered from hyperthyroidism. There is no therapy nor surgical procedure that will correct the permanently damaged heart, or the degenerative changes in the liver, kidneys and brain that are the direct result of long-continued hyperthyroidism. This type of patient repre-

sents an individual who cannot be cured finally and completely by any means at our disposal and the problem of hyperthyroidism is essentially that of early recognition and adequate surgical intervention.

In regard to the anesthesia in cases of Graves' disease we at the Post-Graduate Hospital have become less and less inclined to use local. We have been employing, with increasing success, rectal anesthesia in all of our cases of hyperthyroidism. This anesthesia is administered in the patient's room and the patient falls asleep there and avoids thereby all the nervous excitement otherwise attending a trip to the operating room.

Too much protest cannot be made against the ill-advised use of iodine for the community in general. Iodine has its place in deficient secretions of the thyroid; it has a greatly enlarged place of usefulness as a preoperative measure in Graves' disease; but its use in other conditions is attended with great danger.

DR. DONALD C. MINER (Jersey City): Unfortunately it is becoming all too common to find that exophthalmic goiter patients coming to operation have been thoroughly iodized for prolonged periods. In my experience with such cases the preoperative detoxication process with Lugol's solution for eight to twelve days is thus made relatively ineffective. These patients react to operation as in the days before the use of Lugol's solution though to a less extent. I find that the previous use of iodine is neutralized to a great extent by giving large doses in those cases before and also after operation—in the latter instances as much as half-dram doses a number of times a day until the reaction is controlled.

As to the anesthetic, ethylene has proved to be ideal and has replaced local. When ether is used, gastric lavage will lessen the ether saturation of the patient, as Ochsner advised.

Our reason for failure in surgery of the exophthalmic goiter patient is removal of too little gland or excessive regeneration of the gland. In the latter instance, as Charles Mayo pointed out, small doses of Lugol's solution continued for some time, prevent to a great degree postoperative regeneration and recurrent toxicity.

DR. GUTHRIE (closing): I appreciate very much indeed the free discussion the paper has brought out, especially the remarks of Dr. Willy Meyer, whom I have always considered one of the foremost surgeons of the country. I

agree with Dr. Moschcowitz and Dr. Heyd that colonic anesthesia is an ideal method for the thyroid patient. I have not used it myself, but one of my colleagues has used the method in many hundred cases successfully. I have always questioned the advisability of giving ether to the seriously sick goiter patient showing a certain amount of cardiac damage. In our hands ethylene works so beautifully that I am satisfied to continue its use.

I am glad it was brought out in the discussion that all this iodine therapy is not due alone to Plummer's work, because I am satisfied great harm is done by the widespread use of iodized table salt and the tablets put on the market by pharmaceutical houses. In regard to the use of iodine in adenoma with hyperfunction, I have seen some cases in which I was sure that it did distinct harm and others in which benefit was obtained.

In regard to the recurrence following operation referred to by Dr. Miner, I have been amazed to see pronounced hypertrophy take place within a short time even after a great part of the gland has been resected. The long-continued use of Lugol's solution after operation cuts down the percentage of recurrence.

## EMBOLIC AND METASTATIC PHENOMENA IN PLEURAL AND PULMONARY INFECTIONS

PAUL W. ASCHNER, M.D.

(Author's abstract)

The association of brain abscess with pulmonary suppuration is well known and commonly referred to as "metastatic" brain abscess. Schorstein collected 69 cases, 38 of which occurred with bronchiectasis and 15 with empyema. The empyema cases were chiefly those of chronic type with persistent sinus long after operation. Of 51 cases of the series 33 presented a solitary brain abscess, of which 25 were in the left cerebral hemisphere. That organs other than the brain may present metastatic abscesses in cases of lung infection is little known. Martius collected 22 cases of brain abscess of pulmonary origin in 6 of which abscesses elsewhere in the body were discovered at

post-mortem examination, in the kidneys, liver, spleen, heart muscle, and ovary.

Following the influenza pandemic of 1918 empyema due to pulmonary disease of various types was frequent. I observed three cases of aseptic cerebral embolism at this time in young individuals with no evidence of cardiac disease to which the emboli might be traceable. All three presented a right hemiparesis or hemiplegia; two recovered completely, in one spasticity of the lower extremity persisted. In the first case hemiparesis occurred two days after drainage of a streptococcus empyema. In the second, left hemiplegia occurred a week after the chest was drained by aspiration. Subsequently a pyopneumothorax and bronchial fistula were proven by operation, indicating that a lung abscess had perforated. Spastic paralysis of the lower extremity was present four years later. In the third an unresolved pneumonia of the right upper lobe was demonstrated by roentgenogram.

It seems reasonable to ascribe the embolic lesions in all three to thrombi in the pulmonary veins in the vicinity of the diseased lung parenchyma. In the third case there was, moreover, embolic occlusion of the right common iliac artery resulting in dry gangrene of the lower leg and foot. The leg was amputated just above the line of demarcation; the arteries in the specimen were not occluded.

Three other cases of embolism of large peripheral arteries were observed. A man aged sixty-four years with infiltrated lung and encapsulated empyema developed embolism of the right brachial artery and symptoms of cerebral embolism, and died. A boy aged eight years with lobar pneumonia and pleural effusion presented the picture of saddle embolus of the aorta. At operation both external iliac arteries were found occluded, the embolus having evidently broken. He died soon after the embolus in the left iliac artery had been extracted. A man forty-one years of age upon whom bronchostomy was performed for lung suppuration developed the signs

of saddle embolus. Under observation the embolus apparently broke, one fragment occluding the right common femoral artery, the other the left popliteal artery. He recovered without operation, no gangrene developing. In this group of cases it also seems reasonable to ascribe the emboli to thrombi in the pulmonary venous radicles.

The emboli in all these instances were either aseptic or carried organisms of such low virulence that suppuration did not supervene. The distinction between septic embolism and metastatic infection is one of degree rather than of kind. In the first instance an infected gross thrombus is thrown off into the circulation. If such a thrombus originates in a venous radicle of the greater circulation it will lodge in the lung unless there be a patent foramen ovale. If it originates in the lesser (pulmonary) venous system it will lodge in an artery of the greater circulation, most commonly in the brain. In the second instance (metastatic infection) bacteria, singly or in small clumps are thrown into the circulation either directly or by way of the lymphatics. If the primary infection is in the zone of the systemic circulation these bacteria either lodge in the lungs, or they may filter through the pulmonary capillaries and reenter the general circulation, producing in the former instance miliary lung abscesses and in the latter abscess of the kidney, spleen, bones and joints, or brain. If the primary infection is in the lung, however, such bacterial emboli pass directly from the pulmonary veins to the left auricle and thence into the general circulation. The resulting lesions are known as metastatic abscesses or infections.

Nine instances of such peripheral metastatic suppurative lesions originating from a primary intrathoracic focus have been observed in the surgical wards of the Mount Sinai Hospital since 1918. The pulmonary lesions were pneumonitis, empyema—both recent and old, lung abscess, and bronchiectasis. The metastatic infec-



tions occurred in the soft parts, the joints, the epiphyses and the flat bones. In only one case was bacteremia demonstrated. In only one instance did the metastatic lesion assume the foul character of an aerobic infection so frequent in lung suppuration.

When dealing with brain abscess secondary to pulmonary infections the distinction between embolic and metastatic cerebral suppuration is difficult to maintain not only clinically, but also pathologically. The clinical manifestations of brain abscess are well known and will not be detailed here. Of seven cases suspected only three could be subjected to craniotomy and in two the abscess was found. An observation of clinical importance was made from the review of our cases; namely, embolic phenomena occur especially in those patients who have hemoptysis or postoperative hemorrhage from the lung after pneumotomy for drainage.

A review of the post-mortem records since 1918 was made and the results tabulated:

detailed examination with reference to this point would probably yield a still larger incidence.

The occurrence of convulsions, collapse and even death upon exploratory puncture of the chest, or irrigation of an empyema cavity formerly ascribed to "pleural shock" are now known to be cases of cerebral air embolism. A number of such instances have been observed in our cases. In one case, that of a woman upon whom bronchostomy for post-tonsillectomy lung abscess had been performed three years previously, this bronchostomy was explored for hemorrhage from the tract. She died suddenly 10 minutes after the operation was begun. At autopsy air was found in the heart and in the vessels of the brain.

#### CONCLUSIONS

The peripheral complications of pulmonary infections may be embolic or metastatic. The embolic complications may be aseptic or septic, and are referable to thrombotic and phlebitic lesions of the

#### EIGHTEEN COMPLETE EXAMINATIONS INCLUDING THE BRAIN

##### *Pulmonary lesion*

- 1 Lobar pneumonia
- 1 Bronchopneumonia and empyema
- 1 Bronchopneumonia and empyema
- 15 Pulmonary suppuration

##### *Pulmonary vein lesion*

- None
- None
- None
- 2 Thrombosis
- 1 Phlebitis
- 1 Arteriovenous aneurysm

##### *Embolic or metastatic lesions*

- Purulent encephalitis
- Abscesses of kidney
- Meningitis
- 6 Brain abscess
- 1 Infarct of kidney
- 1 Abscesses of both kidneys
- 1 Gluteal abscess
- 1 Sacroiliac joint suppuration

In 43 examinations, complete except for the brain, the following secondary lesions were noted: infarction of spleen, 2; abscesses of kidney, 2; multiple joint infection, 1; peritonitis, 1. In four cases pulmonary vessel lesions were demonstrated: purulent thrombophlebitis, 2; eroded veins in wall of abscess, 1; thrombosis of small artery with infarction at site of exploratory puncture, 1 (sudden death).

In 42 cases only the thoracic viscera were obtained. In four of these thrombosis in pulmonary vein radicles was found. Thus in 98 cases pulmonary vascular lesions were found in 12 instances. A more

pulmonary veins. They may involve not only the brain but arteries of the extremities, kidneys, and spleen. In empyema cases embolic phenomena should be referred to the underlying pulmonary disease and not to the empyema per se. Metastatic infections of soft parts, joints, epiphyses and flat bones, occur in pleural and pulmonary infections, more frequently in empyema and lung suppuration than in simple pneumonitis.

#### Discussion

DR. MORRIS K. SMITH: I would like to ask Dr. Aschner if he thinks that postoperative emboli in the general circulation are ordinarily



preceded by an intermediate pulmonary complication. I recall a patient of mine who developed an embolus of the brachial artery following hysterectomy. Yet no signs of lung disease had been noted.

DR. WALTER M. BRICKNER: A word in this connection concerning metastases from pulmonary actinomycosis. Almost always actinomycosis spreads by contiguity. Occasionally, however, the disease is blood-borne. Instances of this are those rare ones of the pyemic form of the disease, and those also rare cases of actinomycosis of the central nervous system. Excluding meningeal actinomycosis developing by direct extension from facial and vertebral involvements, the reported cases of actinomycosis of the brain, sometimes found as an isolated abscess, are probably always metastatic, although some of them have been reported as primary. In some of these there were but incomplete autopsies. A study of cases in which there were more or less complete histories or autopsies would indicate that many, at least, of the recorded instances of cerebral actinomycosis were metastatic from the lung. It must be remembered that actinomycosis sometimes subsides spontaneously, and thus, rarely, pulmonary actinomycosis recovers under treatment, or by expectoration. In one case of actinomycotic abscess of the brain an "extinct" focus was found post-mortem in the lung.

DR. ASCHNER (closing): In reply to Dr. Smith's question about peripheral embolus following abdominal operation, we must assume that there was either a patent foramen ovale, or that there was an unrecognized lung lesion, possibly a silent bronchiectasis which set up a thrombotic process in the lung. Dr. Brickner mentioned actinomycosis of the lung as a possible cause for brain abscess. We recently had a patient in the hospital for an infiltrative pulmonary lesion thought to be neoplastic. At operation a specimen was removed and proved to be inflammatory. The following day nodules in the skin all over the body developed. One of these was removed and sent to the laboratory and on section proved to be an inflammatory lesion containing streptothrix. The patient later came to autopsy and there was found a primary streptothrix infection of the lung and a general dissemination with metastatic lesions in the spleen, kidneys and other organs. The dissemination was probably induced by the trauma incident to the pulmonary exploration.

## PRESENTATION OF CASES

### END-TO-END ANASTOMOSIS OF THE BRACHIAL ARTERY IN A COMPOUND FRACTURE OF THE HUMERUS

JASON SAMUEL PARKER, M.D.

White Plains, N. Y.

R. L. was admitted to the White Plains Hospital July 15. His left arm had been crushed by an automobile, immediately above the elbow. An area of skin as wide as the tire and half the circumference of the arm was missing. The median and ulnar nerves were exposed but were intact. The biceps and brachialis anticus were completely cut across, the humerus was fractured 3 inches from its lower end and the brachial artery was completely severed. The forearm was blanched, cold, pulseless, and I could have clipped through the crushed triceps and amputated the arm with a few snips of a scissors.

End-to-end suture of the brachial artery, by the Carrel method with silk was performed with some difficulty because the artery 2 inches distal to its division was crushed and had to be sacrificed. To make an approximation the upper end was dissected to the middle of the arm and two branches which I took to be the inferior profunda and anastomotica magna had to be ligated. The fracture could not be reduced because of tension on the sutures. The contused muscle was excised and the ends were sutured. A molded splint was applied.

Convalescence was stormy. The ends of the muscle all sloughed and the lower fragment protruded. Circulation improved, the protruding fragment which had united at an angle was cut off and the wound finally closed. It is interesting to note nature's effort to overcome the deformity. The original scar, 2 by 5 inches, has contracted to about  $\frac{1}{2}$  inch by 3 inches. The lower fragment is straightening out and the scar tissue is developing into a sort of a long tendon for the biceps. He has over one-half the normal range of motion at the elbow and has a perfectly good hand. The artery is patent although the contraction of the scar has made the radial pulse more feeble. I am showing him as an example of what may be accomplished by conservative methods.

(No discussion)

## Section of Surgery

## RECURRENT THYROGLOSSAL FISTULA

HERBERT WILLY MEYER, M.D.

Mrs. R., 39 years of age, I operated upon in November, 1926, at The Lenox Hill Hospital for recurrent patent thyroglossal duct.

Following a severe cold nine years ago she noticed a swelling in the mid-portion of her neck at the level of the hyoid bone. Local excision of the cyst was performed in New York at that time and after some delay the wound healed. After breaking open again a second operation was performed in Washington, D. C. under local anesthesia. In spite of this operation a third intervention became necessary and the same surgeon who had performed the first operation here in New York, operated again. This time the operation was a very radical one. In November 1925 under general anesthesia the entire fistulous tract was excised from the skin of the neck through into the pharynx. The wound never healed completely and a fistula developed which constantly discharged mucus.

Mrs. R. was referred to me for operation by Dr. F. McKelvey Bell, of New York, who had studied the case carefully. Roentgenograms made by injection of the fistula with bismuth paste showed that there was a tract that passed over the upper border of the hyoid bone into the tongue and there had several ramifications, probably due to the scar tissue caused by the previous operation in 1925. Some of the injected bismuth paste invariably entered the buccal cavity.

In planning the operation, in this instance the fourth surgical intervention for the same trouble, two points seemed essential: first, good exposure; second, total extirpation of the fistulous tract.

Colonic anesthesia was employed in order to have a free operative field without the annoyance of difficult breathing with mucus in the throat, and to be free of anesthetist's appliances and hands about the head and neck. With this type of anesthesia we could expect the patient to be quietly asleep on the operating table. Secondly, a sufficiently long incision was necessary so that all the landmarks of the operating field could be positively and easily identified.

To insure the total excision of the fistulous tract the first precaution taken was an injection of the tract by Dr. Bell on the operating table

just before the operation. We used Beck's paste colored with methylene blue. The injection again passed through the duct into the pharynx and so we were certain that the entire tract was filled. If the specimen could be removed without seeing the blue paste at any time during the operation one could be reasonably sure that the operation would prove successful.

The principles followed for the technique of the operation were based upon the publication of Sistrunk of the Mayo Clinic.<sup>1</sup> These were the dissection of the cyst to the hyoid bone, the invariable removal of a portion of the hyoid bone, and then the coring out of the duct with surrounding muscle tissue from the hyoid bone to the foramen cecum of the tongue, passing through the muscles of the tongue. This duct usually lies in the direction of a line dividing the right angle formed by two lines, one dropped perpendicular from the upper anterior border of the hyoid bone in the midline to the cervical spine and the other running horizontal from the hyoid bone upward towards the skull.

Having operated with success on six cases of recurrent thyroglossal duct according to this technique, the same principles were followed in this case with minor modifications.

The old scar with fistulous opening was circumcised and the incision was lengthened to about three inches. The skin and platysma were reflected upwards and downwards until the landmarks could be made out. These were the anterior bellies of both digastric muscles above with the mylohyoid muscle forming the floor of the wound. Below the thyroid cartilage was the landmark, and on either side the hyoid bone with the border of the submaxillary salivary gland. From these landmarks the old hard infiltrated scar tissues were dissected to a point where they were attached to the mid-portion of the hyoid bone. About one centimeter of the mid-portion of the hyoid bone was then removed, attached to the specimen. The scar tissue of the previous operation could then be palpated in the tongue muscles. Knowing the usual direction of the duct, the entire scar tissues in the tongue were then cored out in this direction by cutting in healthy tongue muscle tissue with scissors, passing through the geniohyoid and geniohyoglossus muscles. When at the foramen cecum, which was identified by introducing one finger into the mouth and

<sup>1</sup> Sistrunk, W. E. Cysts of the thyroglossal tract. *Surg. Clin. N. Am.*, 1921, 1, 1509-1513.

another in the depth of the tongue wound, the tract was totally excised by cutting through into the pharynx. At no time during the operation was the blue paste encountered although, after the specimen was removed, it was possible to see the blue paste shimmering through the duct at one point. The depth of the tongue wound was then carefully cauterized with Paquelin cautery for careful hemostasis. The divided tongue structures were repaired by interrupted fine chromicized catgut sutures. A small tampon and gutter drain were introduced into the tongue and brought out between the cut ends of the hyoid bone. The cut ends of the hyoid bone were not approximated, as we had done in some previous cases, but were left alone. This gives better drainage and, I believe, later, freer motion of the tongue. The platysma was sutured with 00 chromicized catgut and the skin closed with interrupted black silk sutures.

The postoperative course was uneventful except that all the chromicized catgut knots in the platysma were extruded, one by one, probably not being absorbed on account of the impoverished blood supply caused by the four operations in one small field.

The operation was performed four months ago, the wound has healed firmly, and I believe we can assure the patient of permanent cure.

The purpose of presenting the case is to impress:

1. The value of colonic anesthesia in these somewhat difficult cases.
2. The value of injecting colored Beck's paste just before operation.
3. The value of operating by clearly identified and dissected landmarks, and removing all old scar tissue.
4. The value of invariably removing a portion of the hyoid bone and then coring out the duct through the tongue muscles into the pharynx at the foramen cecum, thus totally extirpating the entire thyroglossal duct.

#### Discussion

DR. F. McKELVEY BELL (by invitation): I had the pleasure of seeing Dr. Meyer do this operation and assisted him. When the patient came to see me she had had three operations and still had an exudation of fluid from what appeared to be the remains of a thyroglossal cyst. I thought that if it were merely a sinus and no glandular tissue remained, injections of

bismuth paste containing five per cent iodoform might close it. This was tried several times but the clear glandular secretion persisted. Radiograms made half an hour after injection of the paste showed little of the sinus but those made immediately after its injection showed it clearly. It ran over and then dipped behind the hyoid bone passing upward and backward through the base of the tongue. The difficulties of this fourth operation were great due to scar tissue and an irregular channel.

### CHOLELITHIASIS WITH ANEMIA, ACHYLIA GASTRICA AND ENLARGED SPLEEN

LEO B. MEYER, M.D.

Mrs. T., aged 43 years, seen first November 25, 1925. Ill five years. Poor appetite, weakness, dyspnea and palpitation, nervousness. No belching, pain, dizziness or headaches. Has had pruritus especially on the inner side of the thighs for ten years.

*Physical Examination:* Very pale. Weight 130 pounds. Looks like a person with pernicious anemia or carcinoma. Liver palpable. Spleen felt three finger-breadths below the costal margin. Heart, lungs, Wassermann reaction and urine, negative.

*Blood Examination:* Red blood cells, 3,712,000; hemoglobin, 55 per cent; white blood cells, 3000; polynuclears, 48 per cent; large lymphocytes, 11 per cent; small lymphocytes, 35 per cent; no nucleated red cells or myelocytes. The picture suggested an early pernicious anemia or carcinoma.

*Gastric Contents:* Total acidity 28 per cent; free hydrochloric acid 14 per cent (subacidity).

*Roentgenographic Examination:* Negative except for hyperperistalsis.

*Treatment:* Diet suitable for achylia gastrica with iron and hydrochloric acid.

One month after coming under observation, spleen still palpable, but hemoglobin 70 per cent.

Between January and March 1926 repeated typical attacks of biliary colic. Roentgenograms of biliary tract at that time were negative.

February. Treatment the same except that during attacks received medication for the relief of pain. Spleen smaller. Hemoglobin 78 per cent.

From March to September, 1926, had no attacks and felt well. Spleen no longer palpable. Weight 140 pounds.

September 26. Complete achylia gastrica. This report was confirmed by two subsequent examinations.

October 1, 1926. Attack of biliary colic repeated several times during the month. Roentgenogram of gall bladder at this time showed eight clearly outlined biliary calculi each the size of a large cherry pit. A confirmatory picture taken two weeks later showed only seven calculi. Between the two examinations the patient had had a very severe attack of biliary colic.

November 1, 1926. Operation. Typical cholecystectomy and appendectomy. The gall bladder contained seven calculi.

December 18. Patient "feels fine." Weight 120 pounds. Hemoglobin 75 per cent. Red blood cells 4,160,000; white blood cells 5700; polynuclears, 59 per cent; and large lymphocytes 9 per cent.

Because of the large spleen and severe anemia with an achylia gastrica which persists, I have suggested that the patient be treated as a case of pernicious anemia. She is therefore on a liver diet and is taking hydrochloric acid, iron and arsenic.

January, 1927 weight 135 pounds. Whether the gall-bladder condition is an intercurrent one or whether it stands in direct causal relation to the patient's condition as it was when first seen, is at present subjudice. This patient presents an interesting study. She has been relieved of a cholelithiasis by operation. Before operation, in fact before any symptoms pointing to cholelithiasis appeared, she presented symptoms of a severe general condition which apparently cleared up before the operation. What this condition was I do not know. Although she is now free of all symptoms I believe the condition for which she first consulted me is still present, but in a remission stage.

(No discussion)

## LUNG ABSCESS

LOUIS CARP, M.D.

F. A. V., aged forty-two years, salesman, married, white, was admitted to the private pavilion of the Knickerbocker Hospital October 23, 1926, and discharged December 17, 1926. His chief complaint was cough, fever and weakness for four weeks. His past and family histories were irrelevant. Present illness: Six weeks previously the patient had an attack of "flu" in which he had cough, fever, and pains in his extremities.

He was in bed at irregular intervals for one week. He then went to business feeling a little weak and he also noticed that he had fever especially at night. He kept on working and walking about with very little cough and no expectoration but he noticed that he had a foul taste in his mouth and his friends called his attention to his foul breath. These symptoms had been especially marked for four weeks before admission and he also noticed that his cough and foulness of breath increased when he lay on his right side. Occasionally a little foul material would be coughed up into his larynx which he would then swallow. One week before, his physician had a roentgenogram made of the chest which showed an area of infiltration in the upper portion of the left lower lobe opposite the fourth and fifth interspaces anteriorly, and eighth and ninth interspaces posteriorly, extending from the left hilum to the axillary region. Two days later a fluid level was sought by roentgenogram in this area of infiltration but it could not be found. A diagnosis of lung abscess was made, nevertheless. I then saw him when he was still ambulatory. He had a foul breath, and was slightly dyspneic, and there were very few signs that could be found in the left chest. Conservative and postural treatment were advised, but the patient persisted in attending to his business and three days later (two days before admission), he suddenly began to have great pain in his left chest especially on breathing. He was prostrated, very short of breath, and he went to bed with a temperature of 105°, and perspired a good deal, especially at night. There had been no chills. He had lost about ten pounds in weight and the pain in his chest had become progressively worse.

Physical examination showed an intelligent middle-aged man, pale, acutely ill, breathing heavily, and in pain. He had a very foul breath. Examination of his chest showed the respiratory excursions on the left side very much diminished, with slight edema over the left chest wall below the axilla. He was very tender over the left seventh and eighth interspaces in the midaxillary line. There was tympany over the left chest especially in the lower half and here the breathing was diminished. Over the left upper lobe posteriorly, there was bronchial breathing. The heart was pushed over to the right about 2 cm. His temperature on admission was 101° which rapidly increased to 104°; pulse 116; respirations 30. It was felt that the patient

had a lung abscess which had ruptured into the pleural cavity and it was deemed wise, considering his condition, to wait for further stabilization of the mediastinum. A roentgenogram of his chest taken two days after admission showed an irregular mottled shadow in the lower half of the left lung field, densest at its lower outer portion. The heart was displaced to the right. There was evidence, therefore, of a small pleural effusion and probably an abscess in the underlying lung. The sputum showed many pus cells, Gram-positive cocci and lanceolate diplococci. There were no tubercle bacilli. His urine showed a very faint trace of albumin.

Operation was decided upon and on October 25, 1926 (two days after admission), under local block and infiltration anesthesia, 3 cm. of the seventh left rib in the posterior axillary line was resected subperiosteally, after aspiration of about 10 c.c. of foul, yellowish pus. About 60 c.c. of foul pus and necrotic tissue were evacuated from a well walled-off cavity which was apparently in the lung and measured about 7 cm. by 5 cm. A large soft tube was inserted into the cavity and surrounded with iodoformized gauze packing. The wound was left wide open and packed with iodoformized gauze.

The patient stood the operation well, but immediately thereafter he became cyanotic and had a pulse of about 120. This, however, gradually disappeared in the course of a few hours but the evening of the operation his temperature went to 105°. He drained large quantities of very foul pus for about three weeks and then the odor was less perceptible. The wound itself was covered with dry, thick exudate of a mouse-gray color which did not bleed and gradually separated in seven days, leaving bright red and bleeding granulations underneath. In seven days he was allowed on the roof in a chair, there was slight cough and the foulness of his breath disappeared. The drainage tube was still left in place. All this time there was distinct evidence of a bronchial fistula. Twenty-five days after operation, the patient had a sudden violent coughing spell in the morning with difficulty in expectoration and without pain. This was the first occurrence of this kind since operation. The bronchial fistula was found to be apparently closed. The next day he had a very profuse foul discharge from the wound and a severe coughing spell, and the bronchial fistula was found open again. Tube drainage was continued. The day after there was only slight cough without expectora-

tion, there was less discharge and the fistula was apparently closed and stayed closed until he became entirely well. It is significant that for about two weeks after the closure of his bronchial fistula he had irregular high temperature, cough, and a foul odor to his slight expectoration. His drainage tube was removed after having been gradually shortened, forty days after operation. He was discharged well with the wound practically closed and with no cough or pain in the chest fifty-three days after operation.

Reexamined on February 7, 1927, about seven weeks after discharge from the hospital, he had gained his original weight, had no cough or pain in the chest, but still felt a little weak. Examination of the chest shows slightly diminished breathing at the left base and a roentgenogram shows at the left base a dense shadow, probably scar tissue in the lung and pleura. The left diaphragm is slightly elevated and shows diminished mobility. There is compensatory emphysema on the right side.

The interesting points in this case are:

1. A probable central pneumonia with a metapneumonic lung abscess which apparently developed in two weeks.
2. The roentgenograms showing, first an abscess in the lung proper and subsequently a rupture of this abscess into the pleural cavity.
3. The pyopneumothorax which made the patient so sick two days before admission and despite which he was operated on two days later giving the mediastinum a chance for stabilization.
4. As soon as the abscess was entered the patient was turned on the affected side in order to prevent aspiration of pus into the healthy lung tissue.
5. The immediate postoperative shock.
6. The foul profuse discharge and mouse-gray color of the exudate in the wound (probably caused by symbiotic aerobic and anaerobic bacteria). This exudate gradually came away in seven days leaving bright red and bleeding granulations underneath.
7. The bronchial fistula was apparently closed in twenty-five days and it was accompanied by sudden, severe coughing spells and foul expectoration (not present since operation).
8. Patient discharged well fifty-three days after operation.
9. A ten weeks' follow-up shows him in good condition with some thickening at the left base.

(No discussion)

## RUPTURE OF METAPNEUMONIC EMPYEMA INTO BRONCHUS

LOUIS CARP, M.D.

E. N., aged 48 years, female, was admitted to the private pavilion of the Knickerbocker Hospital March 16, 1926, and discharged April 7, 1926. Her chief complaint was weakness and pain under the right breast of two months' duration and foul expectoration of three weeks' duration. She had always been well when three months before she caught cold and coughed for two weeks. She then developed severe pain in the right chest and two days later a diagnosis of right lower lobe pneumonia was made. This condition lasted about two weeks. About six weeks ago she was ambulatory, went outdoors, and began to get stronger. A slight cough and her shortness of breath persisted, however, with no marked temperature until four weeks ago when it began to rise to 101°F. at night. She had pain in the right chest anteriorly which was especially marked at night. About three weeks ago she began to expectorate large amounts of very foul mucopurulent material which was more marked when she lay on her left side. One day before admission her physician aspirated the right chest in the seventh interspace in the mid-scapular line and withdrew about 10 ounces of thick, yellowish pus which contained a pneumococcus. This gave her slight relief. She has become very pale, has lost weight and strength; her appetite is very poor.

**Physical Examination:** Patient looks chronically ill and has a waxy complexion. Respirations 26; pulse 104; temperature 101°F. Her pharynx is congested, tongue coated, teeth and lips dry. The right chest moves only slightly with respiration and there is dullness to flatness from the spine of the scapula to the extreme base. The breath sounds and whispered voice are greatly diminished to absent. The heart is pushed over to the left about 2 cm. but its sounds are good and clear and there are no murmurs. The rest of the physical examination is negative. A roentgen-ray examination of the chest showed a sharply circumscribed, dense, circular shadow which occupied the major portion of the lower right lung field, and about this shadow the lung field was poorly illuminated. Roentgenography by the double exposure method showed this shadow to be equally distant from anterior and posterior chest walls.

It was felt that the patient might have a metapneumonic lung abscess which had ruptured into the pleural cavity, but the fact that the pus which was aspirated by her physician was not foul and contained a pneumococcus favored rather a rupture of an empyema into a bronchus. Immediate operation was decided upon and under novocaine infiltration and block anesthesia, a 6 cm. incision was made over the eighth rib in the right midscapular line and a subperiosteal resection of 2½ cm. of this rib was performed. About 32 ounces of thick, yellowish pus without a foul odor and containing large flakes of fibrin were evacuated from a cavity which was well encapsulated and which apparently communicated with a bronchus. This cavity was explored with the finger very gently but no further manipulation was attempted. A large soft tube was placed in the cavity and this was surrounded by iodoformized gauze packings. The patient stood the operation very well and was quite comfortable. There was a profuse discharge from the wound.

The day of operation, her foul expectoration practically stopped. On the fifth day postoperative she was out of bed in a chair on the roof but she still had a very profuse discharge. Her color was much better and she had much less perspiration. On the eleventh day she was allowed to walk and a smaller tube was inserted into the cavity. She complained of a "carbolic" taste when she coughed. This was probably due to the iodoform packing in her wound. The eighteenth day after her operation she had only a very slight discharge and she was walking about easily, felt fine, and was putting on weight. Three weeks after operation she was discharged with a small tube in a small cavity which still, however, communicated with the bronchus. I do not know just when the bronchial fistula was completely closed, but about two and one-half months after discharge she required no more dressings. She has no cough, feels strong, is back to work as a bookkeeper and has no complaints. A roentgenogram taken about eleven months after her discharge from the hospital shows a very slight patch of clouding at the lower and outer portion of the right lung field and the ends of the resected rib are forming a bony bridge. There is a well-healed 6 cm. scar over the eighth rib in the right posterior axillary line and there is slightly diminished breathing at the right base.

(No discussion)

# TRANSACTIONS OF THE SECTION OF ORTHOPEDIC SURGERY NEW YORK ACADEMY OF MEDICINE

*Meeting of April 15, 1927*

THE CHAIRMAN, DR. HARRY FINKELSTEIN, PRESIDING

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## IS GENERALIZED OSTEITIS FIBROSA (PAGET AND VON RECKLINGHAUSEN) CONGENITAL?

I. SETH HIRSCH, M.D.

NEW YORK

PAGET'S name is connected with osteitis deformans, von Recklinghausen's with osteitis fibrosa. The pathological processes are, however, fundamentally similar. These two conditions have in common a disturbance of bone tissue equilibrium which regulates the relation between normal bone removal and new bone formation. This disturbance leads to bone softening, malacia. Between these two diseases there are many transitional stages, so that von Recklinghausen, who includes both in the group of metaplastic malacias ("metaplastic" conveying the idea that the underlying process involves a complete reconstruction), calls Paget's form a hyperostotic metaplastic malacia, and osteitis fibrosa a simple metaplastic malacia.

A study of generalized osteitis fibrosa would indicate that the disease may begin as a simple metaplastic malacia, hyperplastic malacia, or phlegmatoplastic malacia.

The bone changes in fully developed Paget's disease are by no means uniform. In most of the cases there is both porosity and sclerosis of the cortex and cancellated bone, and the marrow may be both fibrous or fibro-osteoid. The constant change is the

softening produced by resorption and fibro-osteoid tissue substitution, with resulting deformity. Later this osteoid tissue becomes calcified and the new bone formed in old and new trabeculae and under the periosteum is responsible for the sclerosis, hyperplastic changes and eburnation. With the von Recklinghausen type, cyst formation is common, with the Paget type, relatively rare.

Paget considered the disease one of middle life. Packard, Steele and Kirkbride in a study of 51 cases found the average age to be forty-nine and one-half years. The youngest in their series was that of a patient of Moizard and Bôurges in whom the disease seems in their opinion to have quite definitely started at the age of twenty-one.

The age of onset as given in the majority of cases reported is usually in the fourth or fifth decade. Stilling reported three cases in which the patients were seventy, seventy-seven, and ninety-two years old.

Instances of involvement at early age have been reported, however. A survey of the literature makes it evident that well-marked examples of the disease have been found from childhood to extreme old age, and that in a number the markings of the



disease as judged by gross deformities were apparent at birth.

Further, if the histories of the reported cases are studied, it will be found that the given period of onset is based on the phenomena, pain, disability and gross deformity. It is obvious that the disease is a slow, insidiously progressive bony change generally symptomless in its development, that it must take a definite number of years to develop and that before the patient's attention is called to it, the most striking changes have already taken place.



FIG. 1. Boy of sixteen with generalized osteitis fibrosa.

The error of judging the period of onset by the subjective manifestations or on the basis of deformity is therefore apparent.

Hence if we are to arrive at a correct idea of the time of onset it would be important to know how long in the average case it takes for the disease to develop its definite bony changes. These studies can be made only roentgenologically for no correct information on this point can be drawn from subjective and objective criteria. It would be necessary to have a roentgenological record of the incipient changes and to study the case until the disease is in its fully developed stage. Such records have not been made con-

sistently, but when made they tend to indicate that the period of onset must be in the earliest period of life.

In the following case of generalized osteitis fibrosa, the patient was studied over a period of fifteen years.

H. W., male, aged eight years, born in the United States, of Russian parents. His mother had died of rheumatism. The patient had three attacks of diphtheria, one of which was followed by a diphtheritic paralysis of the pharynx, with subsequent recovery. He had attended the public school and was always able to keep up with his classmates in his studies. He was bright and wide awake. He was somewhat undersized and undeveloped for his age and poorly nourished, although there were no complaints whatsoever relating to his general health.

At the age of eight years he first noticed a slight protuberance over the right parietal bone and four years later a similar protusion developed over the left cheek. Both of these protusions increased in size very slowly and with the exception of the deformity to which they gave rise, they caused no complaint. His head had been increasing in size since the age of eight. The roentgen-ray report of the entire osseous system at the age of sixteen was as follows:

The characteristic finding seems to be a combination of a hyperplastic and porotic change. The cortical thickening seems to ensheath the bone and is, as a rule, not through to the entire shaft but is confined to localized areas, usually in the middle portion. This and the flaring of the juxta-epiphyseal ends give the long bones the form of truncated cones. This is especially noticeable in the phalanges and metacarpal bones. The epiphyses are apparently well formed, though the ossifying border seems to show as a line of unusual bone density. The epiphyseal line itself is irregular. The bones of the hands illustrate every variety of lesion, the middle metacarpal bones showing the cortical thickening and deformity, the proximal phalanx of the middle finger showing the cystic formation, while the middle phalanx shows evidence of cystic formation, with intervening ridges of increased bone density. The fifth metacarpal bone of the left hand shows the beginning formation of a large cyst and a small multilocular one is visible in the base of the second metacarpal bone. The terminal

tufts of the phalanges seem to be poorly developed, in marked contrast to the hands of acromegalics.

The upper ends of the tibia show evidence of cortical thickening, while the lower ends show evidence of cystic formation. Large, multilocular cysts are visible in the ossa calcis, while the peculiar bowing, with irregular cyst formation and some thickening of the cortex, characterizes the condition of the fifth metatarsal bone.

On the whole, epiphyseal formation seems to be somewhat delayed. The patient was seen at varying intervals until three years ago. All

(4) cysts occur through hemorrhages or through resorption of bone or myxomatous changes in the fibrous tissue. The special points to be noted in this description are the fibrous transformation of the bone marrow with formation of new bone, and the early rarefaction of the cortex which may be reduced to a thin shell of bone or entirely replaced by fibrous tissue, and that both the simple metaplastic and the hyperostotic metaplastic lesions were already present as early as the age of eight years.

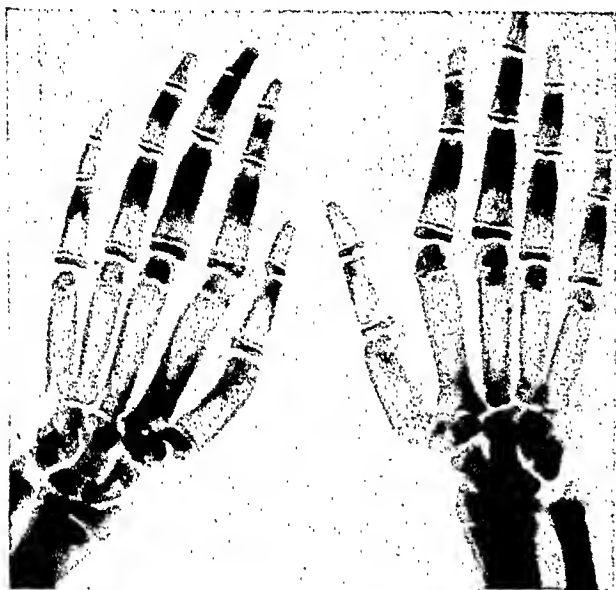


FIG. 2. Roentgenogram of hands showing lesions in metacarpals and phalanges.



FIG. 3. Femur showing bending of neck due to softening resulting from osteitis fibrosa.

characteristic changes are now present in long bones and skull. There was a fracture of the femur, which united firmly. The Wassermann reaction was repeatedly negative.

Von Recklinghausen described this type of generalized osteitis fibrosa as a simple metaplastic malacia found usually in young adults, the course of which is chronic, giving a clinical picture with few symptoms, except the frequency of spontaneous fracture. The primary and essential pathological changes are: (1) a fibrous transformation of the bone marrow which extends into the canals of the Haversian system and results in (2) a local destruction of osseous tissue, (3) parallel with this a new formation of osteoid tissue,

There are other cases in the literature in which at this age or younger a localized lesion, a protuberance in the facial or skull bones, directed attention to the disease which gradually progressed to complete and general bone involvement.

In a case reported by Stack,<sup>1</sup> the remarkable specimens of which are in the Bristol Museum, the skull attained a thickness of three inches; the patient was a female aged twenty-one years. The enlargement of the head was first noted at

<sup>1</sup> Stack, *Bristol M. & S. J.*, 1900.

## Hirsch—Osteitis Fibrosa

seven years. The changes of osteitis fibrosa were not limited to the skull but the femora, pelvis and right tibia were involved. It is inconceivable that even under such circumstances the head deformity could have sprung into existence suddenly. It is logical to believe that it was several years before the bone changes attained sufficient prominence to attract attention.

The period of clinical latency, the periods of apparent inactivity and the gradual

be noted either in the frontal or parietal areas. In many of the cases discovered accidentally, when the patient is questioned regarding a bowed leg, or arm, or a prominence of the frontal or occipital area, he states that it has been present always but no significance has been attached to it. The early origin of the disease may be inferred from another consideration. Paget himself said in 1889 after he had seen 23 cases, "I have tried in vain to trace any inherited tendencies to the disease, I

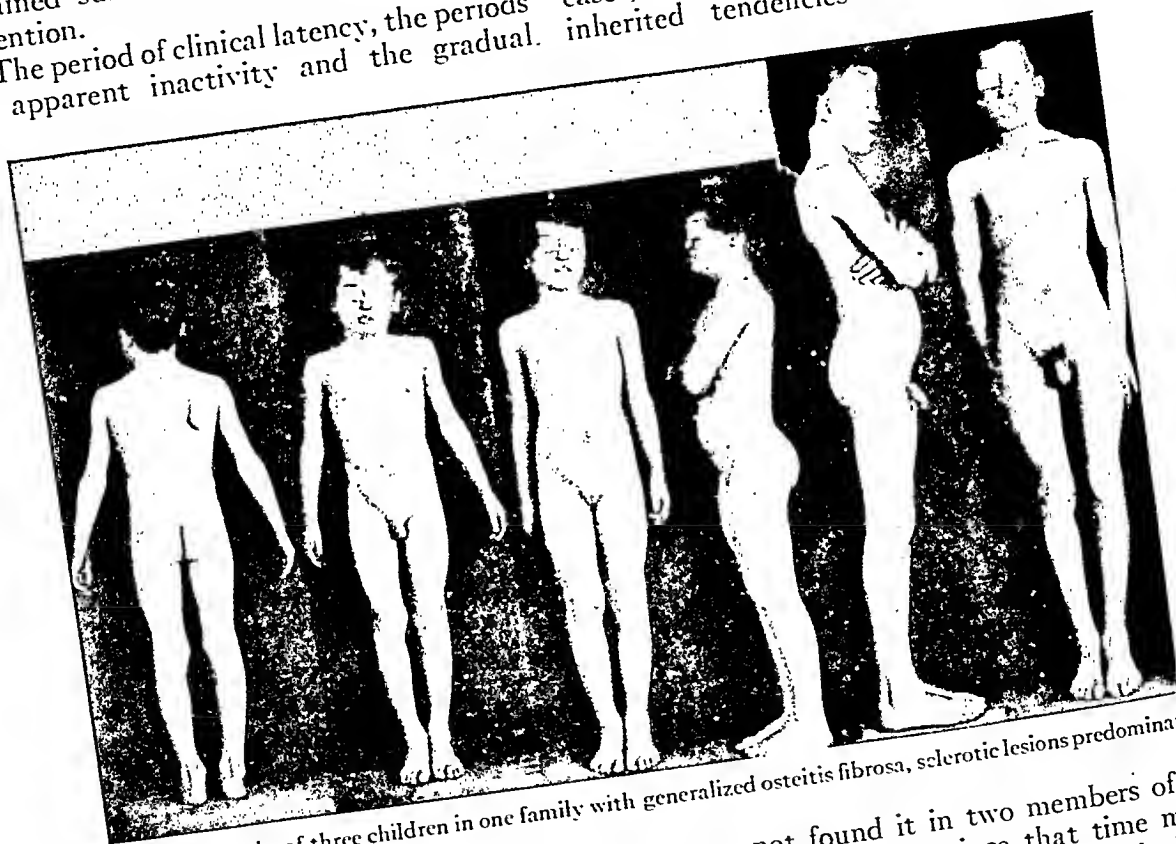


FIG. 4. Photographs of three children in one family with generalized osteitis fibrosa, sclerotic lesions predominating.

development of the changes when the disease is progressive, would tend to bring the time of onset back to the earliest periods of childhood. There is another factor which tends to support this. If the photographs of an individual with this disease are studied certain stigmata of the disease may often be noticeable in the shape of the head, conformation of features, low position of the ears, or in the peculiar bowing of the legs, as far back as such photographs are obtainable, even into childhood. A certain squareness of the frontal area or an asymmetry can

have not found it in two members of the same family." But since that time many cases of more than one in a family have been reported.

A re-examination of the data in the literature and my own observations lead me to the conclusion that heredity exerts a striking and important influence in development of the disease. I have seen cases of father and son, and mother and daughter in adults, and I shall here recite the records of three children, two boys and a girl in a family of nine children, with the early changes of generalized

osteitis fibrosa in their earliest stages. The children are now nine, eleven, and sixteen, and when I first saw them two years ago they showed practically the same lesions as are now present. In two years the lesions have not changed to any marked degree.

The father of the children is forty-four years old, was born in Italy and is a mason by occupation. The mother, also born in Italy, died of nephritis five years ago at the age of forty-two years. They have lived in this country

heavy-set features; mouth kept open; beads of perspiration on nose and upper lip; square head, cranial nerves intact; heart, lungs and abdominal viscera negative; superficial and deep reflexes intact; station and gait good; ears prominent and large.

Tony, is nine years and nine months old. Pregnancy and delivery were normal. No difficulty was noted until he was about a year old, when he started having spasms; he continues to have them; he has had at least one a year, the last one came about six months ago; these spasms start and end within a week,



FIG. 5. Skull of Carmella showing thickening of bones with obliteration of diploic layer.

Insert shows thickening of the base of the skull, the sella not involved, the clinoids sharp.

fifteen years. They had nine children, eight of whom are living, and three of them have the disease.

The eldest, Ralph, is now sixteen years old. As far as known, pregnancy and delivery were normal. He was a full-term baby. His fingers were webbed from the time of his birth. He began to walk at one year and to talk at two years. He was nearly a year old when he started to have spasms. He continued to have them about once a year, until the age of eleven years. He had pneumonia when he was two years old, and was quite ill. Had had no other illnesses. Wassermann reaction negative. Physical examination shows: defective speech; slight webbing of the fingers; contraction of fingers; coarse,



FIG. 6. Chest of Carmella showing lesions in ribs. Thickening of lamellae. Clavicles and spine involved.

that is, the face is out of shape about this length of time. They may come on during the night with no known cause. This child is never unconscious. There are no indications of the difficulty other than facial expression. His speech is also defective. Previous illnesses none. Physical examination shows: square head; heavy-set features; teeth irregularly developed; no paralysis or atrophies; cranial nerves intact; heart, lungs, and abdominal viscera negative; superficial and deep reflexes intact; gait good; well developed, well nourished, good musculature. Wassermann reaction negative.

Carmella, is eleven years and seven months old. Apparently normal at birth. Pregnancy and delivery were normal. Her fingers are webbed. She started to have spasms at the age of ten or twelve months. She had them about every six months or every year until about two years of age. These were characterized by twitchings and spasm without unconsciousness.

She had no other illnesses. Physical examination: coarse, heavy-set features; webbed fingers, marked on left hand; fingers of left hand bent; notched teeth; speech defective; cranial nerves intact; no paralysis or atrophies; heart, lungs and abdominal viscera negative; superficial and deep reflexes intact; gait good. Wassermann reaction negative.

The bones in all these children show similar changes. There is slight bowing of the long bones. The cortex is symmetrically thickened, while the medulla is widened and the cancellated tissue shows an increased calcium deposit. The entire skull and facial bones are thickened so that the diploic layer cannot be seen. The vascular grooves are deepened. There is a tendency towards flattening and broadening of the diaphyseal ends at the epiphyseal lines which gives the metacarpals and phalanges the shape of cones. These are minute localized "cystic areas" in the cortex. The skull thickening is general and fairly symmetrical. The predominating change in the bones is a hyperplastic process with thickened cortex and enlarged diaphyseal ends. It is apparent that the balance between growth of the osteoid tissue and ossification is as yet maintained though small cyst-like areas are just appearing.

There are other instances of several members in one family showing the changes of this disease reported by White, Lunn, Higbee and Ellis, Smith, Chauffard, Berger, Kilner, Robinson, Pick, Parry, Abbe, etc.

The cases reported are by no means an indication of the actual rôle which heredity plays in this disease for many of the family histories are not given or are incomplete in the numerous reported cases. The story of the patient is of no value. It is essential to examine all the members of a family. For to the patient, deformities of the disease may pass merely as a familial resemblance. The determination of this point must be based on roentgen examination which is the only positive test. Absence of the disease in other

members of the family cannot be accepted according to modern criteria unless a roentgen-ray examination has been made—a point on which I have been able to convince myself by an examination of the bones of the son of a patient who was considered normal and in whom I found evidence of the disease. I believe that when the families of patients with Paget's disease are submitted to roentgen examination, this hereditary tendency will be established by a large number of instances. It is important to remember that the transmission of this disease is subject to all the laws, exceptions and modifications of hereditary diseases. Such a theory would also explain the presence of the typical changes in but a single bone. If the disease shows this marked hereditary tendency and in the many cases the lesion already exists in infancy or early childhood, it is logical to infer that the affection is either a congenital hereditary disease due to defective osteoblastic activity.

The most logical and workable hypothesis is that the disease is due to a disorder of bone metabolism probably dependent on absence or perversion of some internal secretion. There is much evidence on hand to prove that disorders of the ductless glands do influence bone metabolism. The association of acromegaly and gigantism with disease of the pituitary gland and the osseous lesions of cretinism are familiar examples. Changes in these ductless glands have been reported in many cases of osteitis fibrosa, although findings have not been confined to one gland.

The close parallelism between the mineral metabolism of a growing child, a case after partial parathyroidectomy and a case of osteitis deformans was shown by DaCosta who suggested that this depends in some way, either on the absence or on the perversion of some internal secretion, possibly the parathyroids. The studies of MacCallum and Voegtlin have demonstrated the importance of parathyroids in controlling calcium metabolism.

They regulate the metabolism of calcium just as the pancreas regulates that of glucose. According to this theory the parathyroids have an inhibitory action on the excretion of calcium. An increased elimination of calcium resulting in an impoverishment of the tissues and an increased excitability of the nerves, follows parathyroidectomy, or an insufficiency or perversion of the secretion of the parathyroids. Under these conditions, it is supposed that substances arise which can combine with the calcium and abstract it from the body tissues, or to put in another way, there is a disturbance of the specific activity of the bone cell whereby control of calcium content is lost, this being the first step in production of the disease. The bone cell—a highly specialized and differentiated structure—is the key to the problem. It controls the metabolic activities of an area of bone. As long as its nutrition is sufficient it regulates metabolic exchange of lime salts. It may exercise this function by virtue of a supply of hormone from the parathyroid. If, due to substances circulating in the blood, this sensitive cell is damaged, it loses its control over the adsorbed lime salts. The disturbances of this control leading to *haliteresis* may with the growth of connective tissues be the essential steps in producing changes of generalized osteitis fibrosa and *deformans*. There is more post-mortem evidence in favor of a decreased thyroid-parathyroid action being causal than there is for any other factor while metabolic studies of osteitis *deformans* show a greater similarity to that after thyroparathyroidectomy, than to that of most other disturbances of calcium metabolism.

Recent experimental work tends to support the view that the parathyroids neutralize in some way certain toxic substances formed in the body. The effect of parathyroidectomy is to produce an extreme excitability of the central nervous system and to result in tetany. The presence of tetanic spasms in children show-

ing changes of generalized osteitis fibrosa would favor the theory of parathyroid deficiency as a causal factor. The three children here reported showed paroxysms which suggested tetany. Hypoplasia of the parathyroids could, according to Escherich, suffice to produce tetany, and such a state of the parathyroids would be likely to have hereditary features. A parathyroid hypoplasia would account for chronic cases and compensation with hyperplasia would eventually follow. Parathyroid hyperplasia has been shown in osteomalacia (Erdheim, Schmorl, Hohlbaum), in rickets (Erdheim, Ritter), hyperplasia and tumor formation in osteitis fibrosa and *deformans* (Maresch, Dawson and Struthers, Meyer, Todyo, and Ask-anazy). The importance of calcium in the growth of the tissues is shown by the great demands made by the developing embryo on the mother for a supply of calcium. Parathyroid deficiency in the mother might produce changes in the bones of the fetus. Association of chronic renal disease with changes in the parathyroids has been frequently noted (Mas-sagha, Quadi, Manca). The mother of the three children reported died of nephritis.

It must be admitted, however, that as yet it is difficult to formulate any exact deductions regarding the physiological rôle and pathological influence of the parathyroids in normal or abnormal calcium metabolism but sufficient evidence has accumulated to indicate that parathyroid disease plays a most important rôle in production of the bone lesions above described.

#### CONCLUSIONS

The lesions of osteitis fibrosa are the essential features of the generalized bone disease described both by von Recklinghausen and by Paget. The disease has until now been considered to be characteristic of adults, but experience and a critical review of the literature would show that these bone changes may be present at any age and that stigmata of



the disease already exist in infancy. The varying lesions as found in early life may terminate in the characteristic picture described by Paget.

The disease is probably congenital with strong hereditary tendencies. Parathyroid lesions are associated with the bone changes and congenital hypoplasia might account for the disease.

I apologize for the sketchy and inconclusive nature of the data presented. I fear I have dogmatized too much on insufficient premises, and I appreciate clearly that more clinical, roentgenological and pathological evidence is necessary to prove conclusively the points I have tried to make, but I hope I have at least asked a pertinent question.

### Discussion

DR. LEON T. LEWALD: The question has been raised previously as to certain recognized conditions in childhood being antecedent to adult Paget's disease. I am not quite certain that Dr. Hirsch's connecting links of the three children in one family is sufficient proof of his contention. Deposits of lime salts without rarefaction are not considered characteristic of Paget's disease, which would make one feel like classifying his cases as some other process in the osseous system. I quite agree with Dr. Hirsch that these cases and true Paget's disease are probably related and are of endocrine origin. At one time I advocated the theory that Paget's disease was of pituitary origin, a sort of opposite of acromegaly, and I still believe that endocrinology explains the etiology better than any other theory. I have studied 48 cases of Paget's disease. In one case the patient when about nineteen had a photograph of himself which showed no bowing. The earliest case of Paget's disease I have seen developed between twenty-five and thirty years of age. I had the opportunity to examine the two brothers reported by Dr. Abbe; they are the only ones of which I have records in one family. I could not elicit a history in any case of father and son or mother and daughter. Dr. Hirsch did not discuss changes in the arterial system; that always comes to the front in a discussion on Paget's disease. The cases shown here look to me like cases of so-called "marble bones."

There have been a number of cases of that kind described in this country and abroad.

DR. ROBERT E. HUMPHRIES: During the past three years we have been studying Paget's disease at the New Jersey Orthopedic Hospital in Orange. At present we have 12 cases under treatment. I am not at liberty at this time to say what this treatment is as there is still much work to be done before we are willing to say we have discovered a cure. Certain conclusions, however, can be reasonably deducted from the work to date. Regeneration of the bones takes place, the cortex becoming clear and well-defined in outline, degenerative areas in the cortex disappear, the medullary cavity becoming smaller, the entire bone decreasing in diameter from  $\frac{1}{16}$  to  $\frac{1}{8}$  of an inch a year. All cases under treatment so far have responded. Pain has been almost immediately relieved, deformity has automatically corrected itself. From the work we have done to date I should say Paget's disease is not congenital, and is not caused by a disease of any one ductless gland, but is rather due to disturbance caused by intestinal toxemia.

DR. SIGMUND EPSTEIN: I have never seen a case of near-Paget's disease in little children, and I do not find parathyroid treatment of any benefit whatever in this affection.

DR. EUGENE H. EISING: Dr. Hirsch has shown us pictures of a dense proliferative osteitis of the small bones of the hands and feet in children. He asks us to believe with him that these represent early cases of Paget's disease.

He offers no corroborative evidence that these cases are Paget's disease. I would hesitate to make the diagnosis, unless there was some evidence in the tibia, pelvis or skull.

I am inclined to believe with Dr. LeWald that the condition represented is not Paget's disease and that time will prove these cases to be some other condition.

I feel that Dr. Hirsch's question remains still unanswered.

DR. MAURICE M. POMERANZ (by invitation): Dr. Hirsch's question seems to me to be an exceedingly astute speculation. Few of us have the opportunity to study our cases over such a long period. Certainly it would be difficult to refute his point with the evidence he has presented. Would he then classify von Recklinghausen's disease as a juvenile Paget's disease?



The plates Dr. Hirsch presents show no striations or cystic changes characteristic of Paget's disease. Although I have never seen a case of "marble bones," I am nevertheless familiar with the literature on the subject and I would like Dr. Hirsch to give us the differential diagnosis between juvenile Paget's disease and "marble bones."

DR. HIRSCH (closing): My paper concerned itself with but one phase of the disease, the consideration of its etiology. I did not enter into details of the other features of the disease. There has been much confusion in diagnosis of these dystrophies arising out of the desire of investigators to create entities not warranted by pathology. That is why the work of von Recklinghausen on the various types of the malacias and their significance is so important and fundamental. Its value lies in that he attempts to make some order out of chaos. There is a disease, generalized osteitis fibrosa, and there are two forms of it, one described by Paget and one by von Recklinghausen. Paget's disease moves through various stages and there is the marked difference between the appearance of the bones in the incipient case in childhood or infancy and in the finished adult case. The bone changes in Paget's disease are by no means uniform. But this appears to be certain, that osteitis fibrosa and the changes of Paget's disease are histologically identical. The roentgenologist is able to arrange these bone lesions in some sort of sequence,

extending from the earliest to the latest advanced lesion. In the roentgenological study lies the key to the problems I have discussed. Parathyroid therapy may be of no value whatsoever in these cases, but that does not prove that the parathyroids are not associated in some way with the disease.

The three cases I have shown in one family, and the boy I studied for fifteen years, exemplify two forms which generalized osteitis fibrosa may assume. I have seen still a third form in which the typical changes of osteitis fibrosa with cyst formations are localized to the diaphyses of the long bones and in the skull. The juxta-epiphyseal ends remained normal. In the cases I described the proliferative changes were present in all the long bones and in the skull and pelvis. The so-called osteopetrosis or "marble bones" is quite another bone lesion and is readily distinguished from osteitis fibrosa by anyone who has had any experience with these dystrophies. In osteopetrosis the diaphysis and the metaphysis have a homogenous density without differentiation of the cortex, spongiosa or the medullary canal. There are encircling bands of lime salts parallel to the epiphysis. The whole bone is changed into a compact structureless mass. The sella turcica is deformed, diminished in size, and the clinoids are thickened, clubbed and enlarged. No such changes are present in the cases I have described.



# REGIONAL ANESTHESIA FOR ORTHOPEDIC OPERATIONS UPON THE SPINAL COLUMN\*

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THE principles involved in the induction of regional anesthesia for orthopedic operations upon the spinal column are, to a certain extent, different from those underlying the injection technique for operations on the other parts of the body. Injections are here, as a rule, made in regions in which the landmarks have been more or less distorted by trauma or disease.

In certain pathological conditions, the normal aspect of the spine is not only altered in the affected segment, but the entire height of the vertebral structure reacts to the partial static deficiency by compensatory displacements. Distortions vary not only with the type of lesions, but also with the level of the spine at which it occurs. Compensatory curves are established which occasionally lead to angular deformities. In certain lateral curvatures the spine is twisted; the vertebrae and ribs, drawn in this rotatory excursion, assume abnormal directions and relationships. The position of the patient on the operating table not infrequently adds another element to these anatomical distortions. Tenderness of the region occasionally makes palpation difficult and definition of the landmarks inaccurate. The soft parts and the bony framework lose their normal relationships and the success of the anesthetic procedure depends mostly upon interpretation and visualization. Correct interpretation is based upon careful analysis of the features presented by the roentgen-ray pictures of the pathological areas and their

adjacent territories. Accurate visualization rests upon a thorough knowledge of anatomy and the ability to see, so to speak, through the overlying fleshy parts, the structural alterations resulting from the traumatic or pathological disturbances under consideration.

## ANATOMICAL EXCURSION

In the *cervical region* in man, the number of vertebrae is almost invariable, but the curve of the cervical column and the occipito-cervical angle vary greatly in different individuals. The thickness of the soft structures of the back of the neck, beneath which landmarks are deeply buried, is ordinarily greatest at the level of the first two vertebrae, the atlas and the axis. Atlas and axis differ markedly from each other and from the remaining cervical vertebrae, not only in their respective morphology, but in the topographic relationship which they bear to each other and to neighboring structures.

The atlas is composed of two lateral masses connected anteriorly and posteriorly by two arches; it has no body. On the outer side of each lateral mass is the transverse process, long and projecting laterally with its foramen which gives passage to the vertebral artery. Of the two arches the posterior assumes greater importance both from the standpoint of the injection technique and from that of the operative procedure. Its root is grooved by the vertebral artery which crosses it on its way to the foramen magnum.

The axis has doubled its body by borrow-

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ing that of the atlas to form the odontoid process. This process articulates in front with the anterior arch of the atlas and behind with the transverse ligament. Its laminae are thick, its spinous process is heavy and projects behind the third vertebra. Its transverse process is short and small and its vertebral foramen is replaced by a short canal curved upward, outward and slightly backward. The transverse processes of the other five cervical vertebrae are short and thin with an anterior and a posterior tubercle. They are shaped like a gutter in which lies the anterior primary division of the nerves. They slant downward, outward and forward and are almost hidden by the lateral masses or articular processes when the cervical column is considered from the back. Each has a transverse foramen through which pass the vertebral artery and veins.

The vertebral artery assumes an almost vertical position in its ascent through the foramina at the base of the transverse processes of the sixth, fifth, fourth and third cervical vertebrae, lying in front of the anterior primary divisions of the cervical nerves. On reaching the axis the vertebral artery passes into the transverse canal of the axis just described and curves outward and slightly backward, then upward and enters the transverse foramen of the atlas. As it emerges from this opening, it curves backward and inward around the posterior aspect of the lateral mass and lies in the vertebral groove on the posterior arch of the atlas. It then pierces the posterior occipito-atlantal ligament and enters the spinal canal.

The posterior occipito-atlantal ligament extends between the foramen magnum and the arch of the atlas with an opening for the entrance of the vertebral artery. The posterior atlanto-axial ligament extends between the arch of the atlas and that of the axis; these ligaments differ from the ligamenta subflava in that they are not elastic.

The posterior arch of the atlas, the

laminae and spinous processes of the axis and of the five last cervical vertebrae constitute the deepest plane of the posterior region of the neck. These bony arches are separated from one another by spaces which are closed by the ligamenta subflava. Between the occipital bone and the atlas, between the atlas and the axis, these spaces are particularly large, the more so in extreme flexion of the head. The laminae of the cervical vertebrae are in overlapping position only below the axis so that the first two interlaminar spaces are in direct relation to the soft structures overlying them. The cerebellum and the medulla oblongata which correspond to the occipito-atlantal space, as well as the cervical spinal cord which begins at the atlanto-axial ligament are thus exposed to injuries by the point of the needle.

Trauma to the vertebral artery is almost impossible in the region below the axis; but between axis and atlas, it can be reached on the outer side of the lateral masses in the open space between the transverse process of the axis and that of the atlas, where it lies in a vertical position. The vertebral artery can still be more readily reached between the atlas and the base of the skull, because of its close proximity to the posterior aspect of the lateral mass and the posterior arch of the atlas against which it rests horizontally. It is there directly exposed to the point of the needle approaching the deep landmarks.

In the *dorsal region* the spinous processes, normally situated in the middle line of the back, serve as superficial landmarks in paravertebral block. The transverse processes are thick tubercles which articulate with the ribs at a distance of about from 3 cm. to 4 cm. from the middle line. The part of the rib just lateral to the transverse process is ordinarily used as a deep landmark for approaching each nerve as it leaves the intervertebral foramen.

In the *lumbar region*, the spinous process bears a constant relationship to the transverse processes of the same vertebra,

its upper margin being in line with these processes. Distortions are here less disturbing than in the dorsal region. In the lumbosacral region, the lack of fusion of the first sacral with the second sacral vertebra is not infrequently encountered. Incomplete sacralization does not interfere with the injection technique generally adopted for blocking lumbar and sacral nerves. Sometimes a loose first sacral is interpreted as a sixth lumbar vertebra; it is then considered in the same light as the other lumbar vertebrae. It could, however, be treated as a first fused sacral vertebra if its relationship to the ilium were closer than with the lumbar column.

In a general way, the posterior primary divisions of the cervical, dorsal and lumbar nerves emerge between the transverse processes and course backwards towards the operative field. From the standpoint of surgical procedure, they are the only ones that need be blocked, since they are the exclusive paths of sensory impulses starting from the operative field. Experience proves, however, that blocking of the anterior primary divisions is necessary as well in order to give better comfort to the patient during the jarring manoeuvres upon the spine.

The *sacral nerves* are injected by the transsacral method. They can always be reached through the posterior sacral foramina, both divisions being injected at the same time. It is unnecessary to give a caudal block, unless the coccyx be involved in the operation.

All these elementary anatomical considerations are of importance to the regional anesthetist for the reason that he must take his superficial landmarks with great accuracy in order to be able to reach the deep landmarks with comparative ease and safety. In approaching the deep landmarks he must know what are the dangerous zones in each segment of the spine and how to avoid them, particularly when distortions are present.

It has been my privilege to anesthetize a certain number of patients operated

upon at the New York Orthopedic Hospital during the last five years for lesions involving each region of the vertebral column. I have selected a few of these cases to illustrate the subject of this paper which can best be discussed by giving details of technique employed in each case. I shall also describe such steps of the operation as will help realize the extent of the manipulations which were accomplished painlessly.

#### RESECTION OF THE POSTERIOR ARCH OF THE ATLAS

A boy, sixteen years of age, on July 29, 1922, in diving struck his head and became paralysed in his limbs. He was treated at Coney Island Hospital where a plaster cast was applied on the neck for eighteen days. On October 21, 1922, he was seen at the New York Orthopedic Hospital and the diagnosis of dislocation of the first cervical vertebra was made and confirmed by roentgen-ray examinations. The atlas and the odontoid process appeared to be dislocated anteriorly on the axis. On November 27 because of labored breathing and the frequency and severity of respiratory disturbances, among other severe symptoms of compression of the spinal cord, resection of the posterior arch of the atlas was advised and probably also fusion of the first two cervical vertebrae. Regional anesthesia was recommended because of the danger of struggling while going under or coming out of general anesthesia.

The posterior aspect of the neck showed a marked prominence in the upper cervical region, due probably to distortion caused by the forward displacement of the first cervical vertebra. The neck was rigid; rotation and lateral bending were especially limited. There was marked fullness of the muscular structures around the affected area and the muscles were stiff.

It was first decided that the atlas would be approached by a midline incision about 4 inches long and extending from the external occipital protuberance downward. The posterior primary divisions of the cervical nerves supply the posterior aspect of the neck as well as the occipital portion of the head. These nerves are best reached by depositing the solution in close contact with the lateral masses of the vertebrae

and the base of the skull, no attempt being made to reach them individually.

The spinous process of the sixth cervical vertebra was quite palpable; it was used as a basic superficial landmark for the selection of the sites of puncture above that level. Two intradermal wheals were raised, one on each side of the process at approximately 3 cm. from the midline of the nape. Two other wheals were raised, one on each side, midway between the external occipital protuberance and the base of the mastoid process. Along the vertical lines joining the upper wheals and the lower ones and proceeding from below upward other wheals were raised about 2 cm. apart.

A needle (the 50/7 of my set), unattached to the syringe, was introduced through each of these wheals in succession and advanced along a posteroanterior plane until bony contact was felt, which I expected was the row of lateral masses. Considering the nature of the skeletal lesion and with due regard to the anatomy of the region, extraordinary precautions were taken in approaching first and second cervical vertebrae. The syringe was connected to the needle after each bony contact had been made and injection was made of 5 c.c. of a 0.5 per cent solution of neocaine to which 10 drops of adrenalin solution 1:1000 had been added to the 100 c.c. prepared beforehand. Injections were then made fanwise in the anteroposterior plane passing through the sites of injection and the sites of puncture, involving the entire thickness of the soft structures traversed by the needle. These fanwise injections not only completed the anesthesia started by the deep injections but served to reduce bleeding to its lowest term.

The operation was performed by Dr. Hibbs. A 4 inch incision was made extending caudad in the middle line from the occipital protuberance, and by careful dissection the spinous process of the second cervical vertebra was exposed. Subperiosteal dissection of this was carried out to the lateral processes, with very little hemorrhage and then the tissues between it and the first cervical vertebra were split and separated in the midline.

When these were retracted laterally on both sides, the dura was exposed for a distance of nearly one inch and it was seen that the spinal cord was here at an angle of about 120 degrees. The neural arch of the first cervical vertebra was still out of sight, due to the anterior displacement of the first cervical vertebra and

the occiput on the second cervical. Careful dissection exposed the laminae of the first cervical vertebra and this was found to be dislocated anteriorly at least three quarters of an inch. Due to this dislocation the spinal cord was angulated between atlas and axis and was pressed against the neural arch of the atlas. All these operative procedures were painless except when sponging, making pressure against the dura. This caused sharp pains in the trunk and legs and caused the legs to jerk.

A blunt periosteal elevator was then placed between the dura and the neural arch of the atlas, and with the chisel, curette and rongeurs about  $\frac{3}{4}$  inch of the entire thickness of the neural arch was removed. Pressure was relieved, the posterior ligament bulged through the space left by the laminectomy and the cord straightened out almost entirely.

Because of the amount of laminae removed from the atlas and because the dislocated vertebra was apparently firmly held in its new position, fusion was not attempted.

There was very little hemorrhage. The anesthesia was perfect, except when pressure was applied to the dura and cord. The patient otherwise felt quite comfortable and read a newspaper during the entire operation.

#### SPINAL FUSION FROM SEVENTH DORSAL TO SECOND LUMBAR

T. W., female, aged thirty years, had a sharp kyphosis in the dorsolumbar region, extending from the ninth dorsal to the second lumbar vertebra with apex at the twelfth dorsal. Spasm, rigidity and pain added to the difficulty experienced in defining landmarks.

Roentgen-ray examination had revealed the left diaphragmatic pleura elevated by a large mass about 6 by 6 inches centered at the eighth rib posteriorly, apparently an abscess.

*Anesthesia Procedure.* Two elements here conspired against the success of the operation: (1) the precarious condition of the patient; and (2) the extent of the operative field, for which an enormous dose of fluid would be needed to produce adequate anesthesia. In consideration of these disadvantages, it was decided to use a weak solution of neocaine and to increase the dose of adrenalin usually employed. Injection was made of 225 c.c. of the 0.5 per cent solution containing 30 drops of adrenalin solution, 1:1000. The dorsal and lumbar nerves were blocked individually from the sixth dorsal to

the third lumbar by modified paravertebral technique. The needle was introduced 3 cm. laterally to each spinous process and advanced in a posteroanterior direction towards the transverse process with which it came in contact rather easily. The needle was then passed above and tangentially to the transverse process to a point, in the dorsal region 1 cm. and in the lumbar region 2 cm. deeper than the posterior surface of that process. Attempt was made to pass the needle over the base of the transverse process rather than over its tip. Injection of 5 c.c. of the 0.5 per cent solution of neocaine was made in each intertransverse space. Through the same sites of puncture, fanwise injections completed the anesthetic procedure. These were carried in an anteroposterior plane and involved the entire thickness of the overlying soft structures comprised between transverse processes and skin. A subcutaneous infiltration along the two vertical rows of puncture and another joining the upper wheals transversely, was the last step of the technique. In making the paravertebral injections, pus was aspirated twice, once at the level of the first lumbar on the right side and the second time at the level of the eighth dorsal on the left side.

The injections were made slowly and the patient closely watched. Considering the poor shape in which she appeared on the operating table and the amount of solution needed to ensure complete anesthesia of such a wide operative field, reaction was slight and in no way influenced postoperative prognosis. The patient had had no preoperative narcotic medication. There was a short period of nervousness accompanied by rapid pulse and light cyanosis of the lips, ears and nails. These circulatory disturbances, aided by adrenalin and exaggerated by her tuberculous condition, cleared up while the operation was being completed. The patient returned to her room feeling as well as when she left it.

*Operative Procedure.* A midline incision was made exposing the tips of the spinous processes of the second dorsal to the second lumbar inclusively. The laminae were exposed to the bases of the transverse processes. The ligamenta subflava were curetted from between the laminae and the articular cartilages removed. Bony bridges were turned down from adjacent laminal margins and interlocked across the interlaminal spaces. The spinous processes were broken down and the wound closed.

#### SPINAL FUSION FROM TWELFTH DORSAL TO FOURTH LUMBAR

F. R., male, aged forty years, was thin, emaciated and had the typical appearance of active pulmonary tuberculosis. There was limited extension of the right thigh and a large soft mass was present in the right iliac fossa. Posteriorly, the lower dorsal and lower lumbar regions were prominent. There was no definite kyphosis, but the spine was rigid throughout with accompanying defensive contracture of adjoining muscles.

*Anesthesia Procedure.* Bilateral paravertebral block of dorsal ten to lumbar five was accomplished with 100 c.c. of 1 per cent neocaine solution containing 12 drops of adrenalin solution 1:1000. This was followed by a field block consisting of fanwise injections through the rows of paravertebral punctures, using 100 c.c. of the 0.5 per cent solution of neocaine containing 10 drops of adrenalin solution 1:1000. Technique was similar to that detailed in the preceding case.

The patient's condition was very good, although pulse rate increased from 110 to 135 during induction of anesthesia returning to normal a few minutes later. There was no cyanosis of the lips and ears, but his nails were slightly bluish, this being explained by the deficiency of his pulmonary circulation as a result of tuberculosis. On being questioned the patient said that he felt quite comfortable. Anesthesia was perfect.

#### SPINAL FUSION FROM SECOND LUMBAR TO FIRST SACRAL

E. T., female, aged thirty-four years, had a very moderate lumbar and left thoracic scoliosis. The lower lumbar and sacral areas were tender. Roentgen-ray examination revealed the presence of a thin disc between fourth and fifth lumbar vertebrae. The fifth lumbar vertebra was subnormal in height and spinous processes of the fourth lumbar to the first sacral were in abnormally close relation. The body of the first sacral was not firmly fused to the second vertebra.

*Anesthesia Procedure.* Paravertebral block was performed from lumbar one to lumbar five and transsacral injections made of the first sacral and second sacral according to usual technique; using 100 c.c. of the 1 per cent neocaine solution containing 10 drops of adrenalin solution 1:1000. Field block through

the paravertebral wheals completed anesthetic procedure. This was made with 100 c.c. of 0.5 per cent solution of neocaine. The anesthesia was very satisfactory; the patient complaining of practically no pain except when undue force was used in retracting. He had a few vomiting spells during operation, but left the table in good condition. There were no postanesthetic disturbances.

#### SPINAL FUSION FROM DORSAL SIX TO DORSAL TWELVE

In this case of Pott's disease, there was a small kyphosis at the ninth dorsal spine. Muscle spasm was quite marked in this area. There existed also in the lower extremities a degree of flexion in the one leg and a painful condition in the other, which rendered the supine position impossible. The patient was placed on his right side, the frontal plane of the body making with the table an angle of about forty-five degrees. He was injected and operated upon in this position.

*Anesthesia Procedure.* Paravertebral block was performed from the fifth dorsal to the first lumbar with 0.5 per cent neocaine solution containing 10 drops of adrenalin solution 1:1000 per 100 c.c. Bilateral field block was then made with a solution of the same concentration, using in all 150 c.c. This included a subcutaneous injection along the rows of intradermal wheals raised on each side of the spinal column to approach the nerves individually and one joining the first upper wheals transversely. Because of the position of the patient injection on the right side was more difficult than on the left. The number of nerves to be blocked and the extent of the operative field, namely, from the fifth dorsal to the first lumbar suggested the use of a 0.5 per cent solution of the anesthetic and the poor condition of the patient made the injection of a comparatively small amount imperative. Only 5 c.c. was deposited at each of the 18 nerves supplying the operative field, leaving 60 c.c. for distribution in the tissues according to the field-block procedure already described.

The anesthesia was satisfactory, but not as complete as desirable. Jarring of the spine was painful and throughout the operation the patient felt much discomfort on account of his position. The anesthesia was light and lasted only about three-quarters of an hour; subsequent injection of the soft structures being

necessary to permit closure of the wound without pain. There was no reaction to the anesthetic and the patient left the table in fair condition.

#### COMMENT

The few cases reported in this paper serve not only to illustrate use of regional anesthesia for orthopedic operations upon the spinal column, but allow certain inferences concerning practical value of the method.

The prone position is best, because it facilitates the paravertebral injection technique and keeps muscles of the back as relaxed as skeletal disturbances permit. Lateral distortions are thus avoided and the patient feels more comfortable, particularly when some of the vertebrae suffer from abnormal mobility. An example of the discomfort caused by lateral position is shown in the last case.

The anesthetic solution employed needs careful consideration as regards both its concentration and the quantity injected. In advanced tuberculous conditions, it is advisable to use a 0.5 per cent solution even in paravertebral block. As high as 225 c.c. was injected in one of the patients with a reaction that gave us no concern and did not justify the administration of any treatment, not even a cardiac stimulant. When the quantity of the 0.5 per cent solution was reduced to 150 c.c. in the last case, for the injection of an equally extensive field, the anesthesia was weak both in quality and duration; but there were no circulatory disturbances of any kind. Analysis of these two cases shows that we should not sacrifice perfect anesthesia to the possibility of a brief period of circulatory reaction which if it should occur, has no clinical significance. Of course there is a limit to the use of the 0.5 per cent solution, and this we would, in these particular cases, fix at 250 c.c. when injection is made very slowly.

The use of large amounts of adrenalin does not seem to help when the blood pressure is low. Those suffering from pulmonary tuberculosis have a defective



circulation which far from being benefited by the adrenalin mixed with the neocaine solution, turns slightly bluish from peripheral asphyxia. The blood oozing from the operative wound may at times be dark. It is now recommended to add but 5 drops of adrenalin solution 1:1000 to each 100 c.c. of the anesthetic solution injected. This is quite sufficient to delay absorption, strengthen the anesthesia and increase its duration.

The modified technique of paravertebral block by which the nerves are approached from a point overlying the transverse process is recommended because the same wheals are used for the field block which is associated with the paravertebral block. In making the barrage as close to the middle as the operative technique permits, forcible retraction causes no discomfort and part of the injected fluid finds its way through the wound. The best advantage derived from the narrow field block is certainly the ischemia of the operative field which facilitates dissection.

No attempt was made to use the regional method for operations on children.

#### CONCLUSIONS

Orthopedic operations upon the spinal column are all amenable to the regional method, provided that the injection technique be considered in the light of individual anatomical distortions. A thorough knowledge of anatomy is the prerequisite of the anesthetist.

Decompression of the cord at the level of the first and second cervical vertebrae is rendered less difficult and certainly less hazardous when regional anesthesia is the method employed. The use of regional anesthesia for similar operations at lower levels of the spine can be made with great advantage both to surgeon and patient.

Extensive spinal fusions are made possible with little or no postanesthetic disturbance, and the prognosis of these operations is greatly improved, particularly when active tuberculosis of the lungs is present.

## FRACTURE OF THE FIFTH METATARSAL BONE WITH SPECIAL REFERENCE TO DELAYED UNION

LOUIS CARP, M.D.

(*Author's abstract*)

Twenty-one cases of fracture of the fifth metatarsal bone will be considered to illustrate a tendency toward delayed union probably caused by poor blood supply. Knowledge of this tendency is necessary for prognosis and treatment.

In 1855 Breithaupt first described the condition known as "fussgeschwulst." He noted that soldiers on the march were frequently disabled by painful, swollen and tender feet, and he attributed this condition to strained ligaments and tendons. Subsequently the condition was described under various other names, but in 1898 Kirchner by roentgenogram first showed it to be a fracture. There have been occasional references in the literature to the slow formation of callus in some fractured metatarsals. Delayed union in some fractures of the fifth metatarsal could easily explain the picture presented in "fussgeschwulst."

The fifth metatarsal bone consists of base, tuberosity, shaft and head. It must be remembered that the tuberosity has a separate epiphysis which makes its appearance at about the twelfth year and is completely ossified at about the sixteenth. The muscle and ligamentous attachments to the base and the shaft play an important rôle in the production of fracture by indirect violence. The nutrient vessel of the fifth metatarsal is very small and is represented by only a few fine branches which anastomose with the small blood vessels of the epiphyses.

The usual mechanism of fracture of this bone is by indirect violence, while its exposed position is a predisposing factor for its injury by direct violence.

An analysis of 21 cases from the Presby-

terian Hospital given in the table shows the following:

tration of calcium or cod liver oil is recommended. Scarification of the fractured

1. Sex	Males.....	9 (47 per cent)				
	Females.....	12 (53 per cent)				
2. Age	Youngest.....	13 years				
	Oldest.....	60 years				
	Average.....	36 years				
		Base	Tuberosity	Shaft	Distal Extremity	Total
3. Violence	Direct.....	3 ( 38 per cent)	1 (12 per cent)	2 (25 per cent)	2 (25 per cent)	8
	Indirect.....	7 ( 64 per cent)	2 (18 per cent)	1 ( 9 per cent)	1 ( 9 per cent)	11
	Doubtful.....	2 (100 per cent)				2
4. Predominant symptoms and signs—	pain, swelling, ecchymosis and tenderness.					
5. Length of disability (16 cases)	Shortest.....					2 weeks
	Longest.....					24 weeks
	Average.....					10 weeks
6. Females tend to have a longer disability than males.						
7. The end-results are good.						

A further analysis of the 20 cases in adults shows that there were five cases which from clinical and roentgen-ray evidence had delayed union. This occurred four times at the base and once at the distal extremity of the shaft. All the other cases that could be followed had characteristic pain, tenderness and edema at and surrounding the area of fracture, which extended over periods of weeks or months. While it is true that soft part injury in association with the fracture might produce these symptoms for a short period, still interference with proper bony union is the most plausible explanation for the long disability.

One would expect in a long bone as small as the fifth metatarsal, that enough union would take place in the cancellous portions in about ten days to prevent mobility of the fragments. In the cortical bone of the shaft, normal calcification should occur in about three weeks. The callus may be scarcely visible in the roentgenogram, it may be excessive, or it may be long and thin. It must be remembered, however, that time for the roentgenographic appearance of callus is variable.

The treatment recommended for fracture of the fifth metatarsal is immobilization of the foot and leg by means of a posterior molded plaster splint, which will permit physical therapy. If there is a tendency to delayed union, the adminis-

tration with a needle introduced through the soft parts in order to produce bleeding may be tried. Excessive trauma to demonstrate mobility of the fragments is to be avoided.

*Summary.* Twenty-one cases of fracture of the fifth metatarsal are reported, with their analysis. Twenty were in adults and of these five showed clinical and roentgen-ray evidence of delayed union. All the latter had a normal blood calcium and phosphorus and a negative urine and blood Wassermann reaction. All the other cases that could be followed had clinical symptoms over such long periods that it is fair to assume some interference in bone repair. The main cause of this condition is probably the poor blood supply of this bone. The treatment is directed toward immediate immobilization and hyperemia. The experience from all these cases tends to show that too long immobilization produces bone atrophy which certainly cannot help bone repair. Weight-bearing in a strong molded plaster splint before one month, where possible, is suggested to overcome this bone atrophy. Between the ages of eleven and sixteen years the epiphysis of the tuberosity is not to be mistaken for fracture.

### Discussion

DR. ARTHUR H. CILLEY: The only cases of this kind that I have seen I treated like an

ordinary metatarsalgia. I have insisted on walking from the first day; and I have not seen any case of delayed union.

DR. SIGMUND EPSTEIN: I think Dr. Carp should have given more attention to the cases that have vicious union especially fractured tuberosities. These are the ones we are most interested in. Many of them are very painful.

DR. HAROLD D. CORBUSIER: There should be no interference with rapid repair such as too much limitation of motion and I do not see the necessity of putting such fractures in plaster casts. There should not be too early weight-bearing but passive motion of ankle and toes is essential. Of course, the fragments should be gotten back into position as soon as possible and as accurately as possible, even if an open reduction must be done. Recently I had to amputate part of the base of the fifth metatarsal for non-union, treated by too long a period of immobilization. The circulation should be stimulated as much as possible, preferably by hot baths and the use of diathermy.

DR. WALTER M. BRICKNER: Dr. Carp has done a service in calling attention to the fact that delayed union is common in these cases and in giving a logical explanation for it. I reported two of these cases several years ago, not many years after the condition was first described by Robert Jones. I believe that prolonged immobilization produces bad results, not only in these metatarsal cases but in all fractures. Dr. Carp spoke of putting a needle between the edges of the fracture to stimulate union by producing bleeding. In cases of delayed union in fractures generally I have for many years practiced Bier's procedure—injecting the patient's own blood (taken from a vein) between the edges of the fragments or around them, and this has often given excellent results. I have had several cases of fracture of long bones that resisted all efforts to secure union and that have responded so promptly after the injection of blood that I have considered this responsible. I have spoken in praise of this method before and have usually heard it laughed at as lacking rationale because there is abundant blood exuded when the fracture is fresh. Nevertheless, when there has been delayed union and the bone ends are more or less smooth, blood does seem to stimulate osteogenesis. I believe the injection of blood in cases of delayed union is often exceedingly useful and that it ought to be tried in all cases before proceeding to more radical measures.

DR. LEON T. LEWALD: Dr. Carp said that the epiphysis of the tuberosity of the fifth metatarsal bone does not show complete ossification until about the sixteenth year. I have always considered this the exception and not the rule.

DR. CARP (closing): It was very interesting to hear Dr. Cilley's method of treatment, to make the patient walk immediately. Some cases do well by this method. If he has never had a case of delayed union, I would like to know how long he followed his cases and how much pain they had weeks or months after the fracture. As to Dr. Epstein's remarks on vicious union, such cases do occur and have been very well described by the French. When there is a large callus it may impinge on the adjacent metatarsal and operation may be necessary. In reply to Dr. Corbusier, I can only say that I believe these patients ought to have immobilization of the foot and leg on account of the action of the peroneus brevis and tertius in flexion and extension at the ankle. I was very much interested to hear about the case in which he had to operate because of delayed union. As far as injecting the patient's own blood around the fragments of the fracture is concerned, that has often been done, but in most instances we have found it efficacious merely to put the needle between the fragments and start a little bleeding. Answering Dr. LeWald, an epiphysis for the tuberosity is, I think, the rule, and complete ossification, according to Schouwey who has done a great deal of work on this subject, is complete at about fifteen and three-fourth years.

## PRESENTATION of INSTRUMENTS

### A DEVICE FOR STRETCHING THE MUSCLES OF THE FOOT AND LEG AND OVERCOMING KNEE CONTRACTURES

HENRY KELLER, M.D.

(By invitation)

This device is a simple stretching bench which is capable, with very slight effort, of stretching the shortened calf muscles, the inverters and everters, as well as the foot muscles proper, and besides is capable of correcting mild flexion deformities at the knee joint.

I have used the device for the last year and I have had a chance to watch the effect of the treatment of the stretching upon some of my patients. There have been five adults, for whom, under the old methods, I would have advocated tenotomizing the muscles. Under this method of treatment I was able to spare them the inconvenience of an operation and a consequent plaster immobilization. All the patients were able to pursue their usual occupations while under treatment, and the results of this conservative method was to my mind just as effective as and perhaps more so than if operative procedures had been instituted.

The apparatus consists of a bench upon

The leather cuff attachments, (9) and (10), are for the purpose of holding the knee straight, so that the stretching of the calf muscles may be more effective. Incidentally, they can also be used when flexion deformity of the knee is present. In attempting to correct the latter it is necessary to anchor the knee to the metal bar (1) in order to get the results desired. By anchoring of the heel part of the foot to the heel cup of the apparatus, and pulling upon the fore-part of the foot with stout webbing or straps, the small muscles of the foot can be stretched effectively, the loose ends of the straps being tied to the special prong-like metal piece attached to the bar of the apparatus.

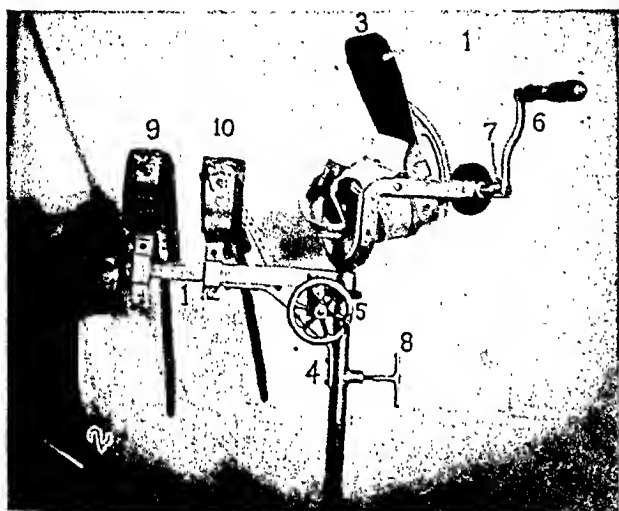


FIG. 1. Stretching bench.

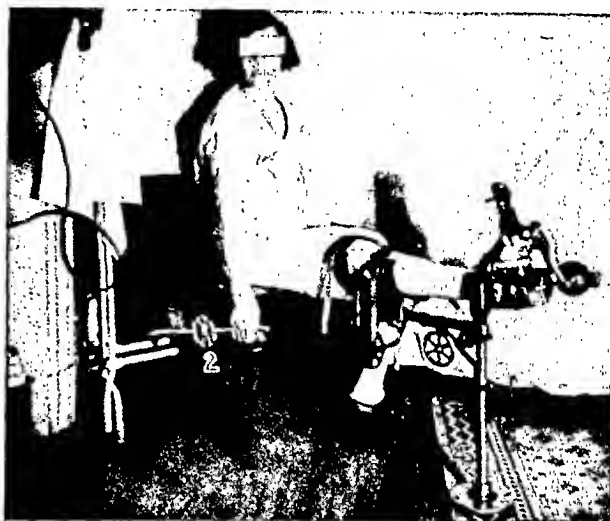


FIG. 2. Stretching bench in action.

which the patient can sit and an attachment of a serrated bar (1) which can be either lengthened or shortened by the handle (2) which is attached to the side of the chair as shown in the illustrations. On the other end of the bar a foot-piece is attached (3) which rests upon a post (4) and can be revolved in or out by the turning of the wheel (5) or anteroposteriorly by the manipulation of the handle (6) which moves the wheel at the foot part of the apparatus. The foot being anchored to the foot-piece moves by the same manipulation. There are two small attachments not seen on the photographs (7); one is near the bench and the other at the outer end of the apparatus, so constructed and so attached as to be able to lock the bar as well as the foot part at the desired position in either extension or flexion. The key (8) attached to the post of the metal part is to hold permanently the limb in eversion or inversion in which the patient's foot has been placed.

The bench idea for stretching I received from J. J. Nutt, and I hereby acknowledge my obligation to him. I wish also to thank Robert Linder, Inc. of New York City for their kind cooperation in perfecting the apparatus.

## PRESENTATION OF CASES

### TRAUMATIC SEPARATION OF SYMPHYSIS PUBIS WITH SEPARATION OF SACROILIAC JOINTS

HARRY D. SONNENSCHN, M.D.

This case is presented as one of dislocation of the iliac bones on the sacrum, with a separation of the symphysis pubis, as a result of severe trauma, rather than as a true dislocation of the sacroiliac synchondrosis.

The case is characteristic of very severe trauma to the pelvis; there results either frac-

ture of the pelvic bones with no demonstrable lesion at the sacroiliac articulation, or dislocation of the sacroiliac joints with no fractures of the pelvis present. This is the fourth case of this type we have seen at the Harlem Hospital.

while crossing a railroad track; the left leg went out to his side, but he did not fall or complain at the time. Two days later the hip was sore but he thought nothing of it, and continued to go to school. After two weeks the pain was bad

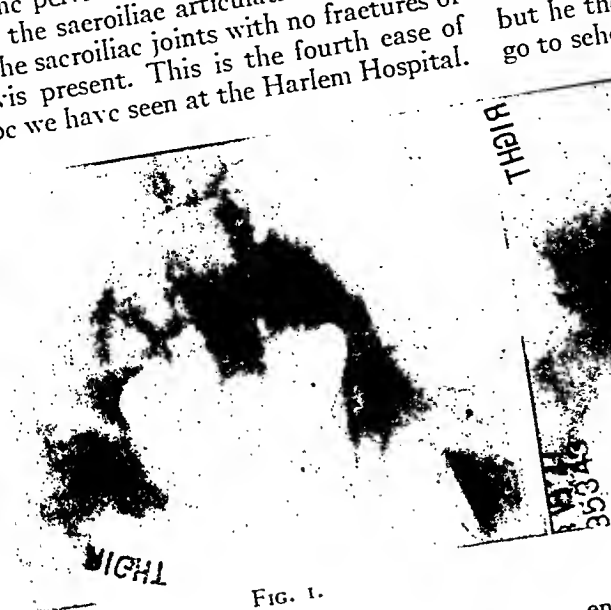


FIG. 1.

This patient, aged thirty-four years, was caught between an automobile and a wall, on February 11, 1927, and was at once admitted to Harlem Hospital in deep shock. Intra-abdominal injury was suspected. He had a compound fracture of the right ulna and compound dislocation of the head of the right radius. A diagnosis of fracture of the pelvis was also made, until a roentgenogram disclosed the true condition. (Fig. 1.)

By means of a swathe, lateral traction was applied to the pelvis, and at the end of six days decided improvement was noted roentgenographically. The patient's general condition was then such as to allow general anesthesia, and an attempt at further reduction was made. The result is seen in Figure 2, the patient's present pelvic condition.

As a matter of note, we were never able to palpate this separation of the symphysis.  
(No discussion)

### EPIPHYSEAL SLIPPING AT THE HIP JOINT, WITH OPERATIVE RESULT

ELMER P. WEIGEL, M.D.

W. H., male, aged fourteen years, was seen by me September 17, 1926. Since March, 1926, he had complained of pain, limp and limited motion of left hip and gradual shortening of left lower extremity. He remembers slipping

enough to consult a physician who treated him for rheumatism. Two weeks after that a roentgenogram was taken which was reported negative. An osteopath seen at this time advised massage. During the summer the leg was becoming thinner and shorter and there was less motion at the hip. The patient was then

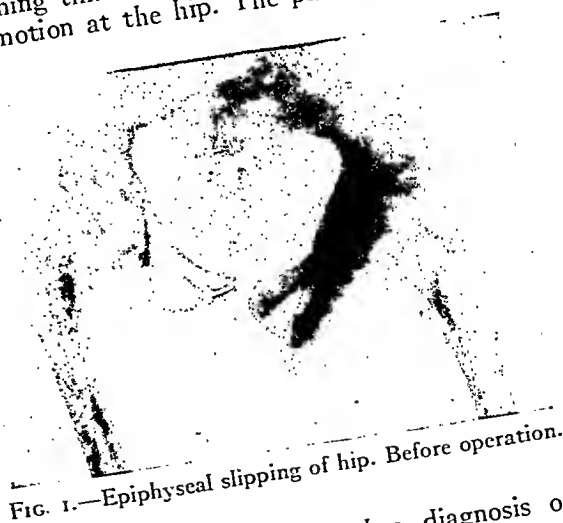


FIG. 1.—Epiphyseal slipping of hip. Before operation.

roentgenographed again and a diagnosis of Perthes' disease was made. He was put to bed and traction was applied.

Physical examination, September 17, 1926: Left leg in marked adduction. All motions at hip limited, particularly abduction. These attempts were painful. There was  $1\frac{1}{2}$  inches actual shortening of the extremity, and  $1\frac{1}{4}$  inch

atrophy of the thigh muscles. Temperature, pulse and respirations normal. Wassermann reaction negative. Roentgenogram showed marked epiphyseal slipping of left hip with leg in adduction.

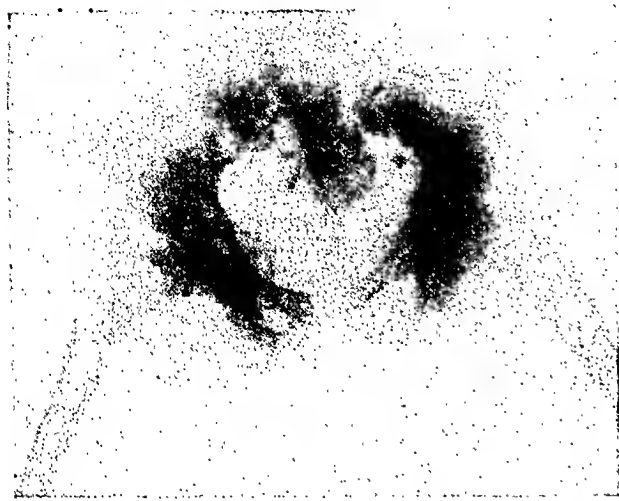


FIG. 2.—Epiphyseal slipping of hip. After operation.

Operation, September 28, 1926: Smith-Peterson incision. Epiphysis was found to have slipped down on the neck so that it was barely touching at its upper margin. There was considerable attempt at callus formation. With a broad osteotome the head was cut free from the neck and the leg was sharply abducted and by means of a periosteal elevator the epiphysis was skidded into its normal relation to the neck where it remained without suture. A double plaster spica was applied in marked abduction for eight weeks.

November 13, 1926. Cast removed. Wound healed. Roentgenogram showed relation of fragment good and callus present. No shortening at this time. Patient began walking and now has no limp or pain.

(No discussion)

### SPONDYLOLISTHESIS TREATED BY BONE GRAFT

ELMER P. WEIGEL, M.D.

M. B., female, aged twenty-eight years, seen by me December 28, 1925, complained of rheumatic pains in her back for one and one-half years. The onset was gradual and not due to trauma. She had always been well and had been doing office work. Family history negative for chronic diseases. She had consulted doctors, had had antirheumatic treatment and also

had had a plaster cast applied for three months with no relief.

Physical Examination: Small girl, well nourished, normal except for a marked lordosis in lumbar region with some tilting to the right.



FIG. 1.—Spondylolisthesis. Anterior view. Before bone graft.

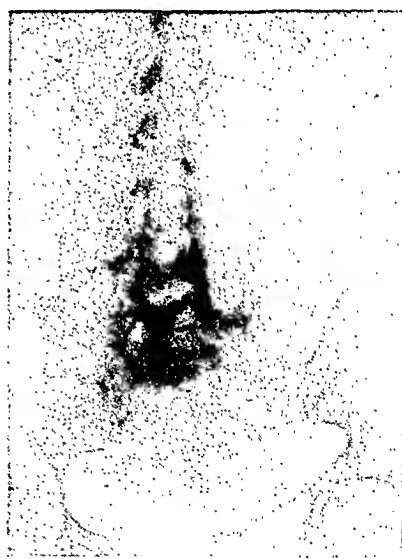


FIG. 2.—Spondylolisthesis. Anterior view. After bone graft.

Motion of lower spine limited and attempts cause pain. Marked muscle spasm was present. Roentgenogram shows slipping of fifth lumbar body forward on sacrum and some lateral displacement to the left. Wassermann reaction negative.

cast was applied and on September 13, 1926, the patient was transferred to the City Cancer Hospital, with diagnosis of a probable giant-cell sarcoma of the right femur. On September 17, the cast was removed at the Cancer Hospital, and after examination, a diagnosis of a badly united fracture was made, and the patient was transferred to the Neurological Hospital (Figs. 1, 2).

The examination there showed swelling of the knee with considerable effusion, and a shortening of that limb about  $1\frac{3}{4}$  inches, as compared with the left side, the patient walking with decided limp. The diagnosis made by the surgeon in charge during my absence, was fracture of the right femur, badly united, and synovitis of the knee. A month later, when I was called I found the condition as outlined above: a good deal of thickening around the lower femoral region, partial ankylosis of the right knee, and a good deal of effusion. The patient also had slight pains in his back. Roentgenograms of both limbs and spine showed many osteophytic outgrowths of the spine, in the lumbar region, also a good deal of thickening around the right femur, with an overriding and badly united fracture of that region.

Diagnosis made then was osteoarthritis of the knee joint and spine and ununited fracture of the femur. The roentgenologist concurred in the opinion. We therefore withdrew some of the

fluid from the knee joint and immobilized the limb in plaster of Paris.

Roentgenogram taken October 14 was more suspicious of a growth, but it was not conclusive, and in view of the fact that there were no other signs of malignancy in the patient's condition, we went on treating him with rest, diathermy and massage.

The last roentgenogram (Fig. 3), January 25, 1927 shows marked destruction of the femur and entire knee joint, establishing beyond doubt presence of a growth, involving the entire fractured area as well as the joint, and resembling in every way a sarcoma.

Dr. Isaac Levine, Director of the Cancer Institute, called in consultation again, confirmed the findings. The patient was transferred back to the Cancer Hospital, where a high thigh amputation was performed on February 15. The pathologist, Dr. Joseph reported the specimen as a spindle-celled osteogenic sarcoma. The patient showed some improvement but now has suspicious signs of metastasis in the lungs and probably the liver. The interesting features of the case are the obscure invasion of the growth with very little pain, its slow, gradual progress, and the question whether the condition followed the previous injury, or whether the fracture of the femur was the result of a weakening of the bone due to the presence of pathological changes.

(No discussion)





## MUSCLE-FASCIA SUTURE IN HERNIA OPERATIONS

IN an editorial discussion of The Rationale of Surgical Measures for the Cure of Oblique Inguinal Hernia (the JOURNAL, March, 1926) we said that Bassini's hernioplasty is not, as many think, a reparative operation upon a disordered inguinal canal, not an attempt to restore the canal to an anatomic normal, but an effort to alter the architecture of the canal; for the chief plastic feature of Bassini's operation and of most of its modifications is the attachment by sutures of the so-called conjoint tendon (of obliquus internus and transversus) to Poupart's inguinal ligament, thus essaying to provide a muscle support for the peritoneum and abdominal contents across an area where *normally no such support exists!* Further, we said that what is sutured as "conjoint tendon" is not sutured at all (except at its very termination), but the rounded edge of the obliquus internus muscle; and that much misgiving has arisen concerning dependability upon union between muscle and aponeurosis thus artificially contacted. We quoted the conclusion of Seelig and Chouke from their dog experiments,<sup>1</sup> that "normal muscle will not unite firmly with fascia or ligament. It is, therefore, a useless procedure to suture the abdominal muscle to Poupart's ligament," a conclusion that had been widely accepted, although not in agreement with the observations of some surgeons made at secondary operations.

Our editorial was prompted partly by the appearance of the assertion of A. R. Koontz, of Baltimore,<sup>2</sup> that if Seelig and Chouke had removed the layer of areolar tissue that separates the fascia lata from the underlying muscle before suturing these structures they would have secured, as

he did, firm fibrous union between them. Koontz also secured good union, in his dogs, by suturing the obliquus internus to Poupart's ligament, even though the muscle had to be drawn down under considerable tension; and he demonstrated fibrous tissue growing from the ligament into the muscle, and capillaries passing freely from the muscle coverings into the ligament. Gallie and LeMesurier had also demonstrated in their experiments upon tendinous and aponeurotic structures that it is important to have no intervening areolar tissue; and, in fact, experienced herniotomists rub this thin layer off the ligament with a gauze wipe or scalpel.

Seelig is not convinced by Koontz' experiments and maintains the opinion based on his own.<sup>3</sup> It is therefore of interest to note in last month's *Annals of Surgery*<sup>4</sup> the report of dog experiments in muscle-fascia suturing by Rosenblatt and Cooksey of Detroit. They repeated the muscle-fascia lata operations of Seelig and Chouke and of Koontz and the inguinal muscle-ligament suturing of Koontz. Their observations in twenty-seven dog operations support those of Koontz entirely. They found that firm union resulted in all cases in which the areolar tissue was removed from the muscle and fascia before suturing, whether in the inguinal canal or in the thigh, and that the general type of union is the same as that between fascia and fascia.

That the rounded muscle can be thus united to the inguinal ligament is quite apart from the rationale of such a procedure which, as we pointed out in the editorial referred to, is not only not a restorative step but, in many cases of inguinal hernia,

<sup>1</sup> *Archiv. Surg.*, 1923, vii, 553.

<sup>2</sup> *Surg. Gynec. & Obst.*, 1926, xlii, 222.

<sup>3</sup> Personal communication.

<sup>4</sup> lxxxvi, 71.

is not a necessary one. As Rosenblatt and Cooksey state in their conclusions, it is not always indicated to suture muscle to fascia, but it may be relied upon if areolar tissue is first removed. Probably union will be more certain if the smooth edge of the muscle is also traumatized by numerous snips of the scissors. The point of interest in these experimental demonstrations is that the more disfiguring and more complicated operation of weaving strips of fascia lata back and forth between muscle and ligament (Gallie and LeMesurier) should be reserved for those cases in which satisfactory contact of substantial structures cannot be made. These are the cases of, especially, recurrent or of very

large hernia in which transversus fascia is grossly deficient and in which the muscles are attenuated and widely separated from Poupart's ligament. In some of these a transplantation of a sheet of fascia lata might be better than a weaving of fascial strips.

In most cases of oblique inguinal hernia, we repeat, the high ligation of the sac and the restoration of the transversus fascia are steps more important than plastic closure of the canal. The latter is undeniably useful, however, as an artificial support for the peritoneum whenever its normal support, the transversus fascia, cannot be certainly restored by suture.

W. M. B.

## A TRIBUTE TO DR. L. L. HILL

TO accompany the glorious appreciation of Lord Lister, published in this issue of the JOURNAL, I regard it as a privilege to present a sketch of its author. Every Southern surgeon will rejoice with me in reading the eulogy of a master by his devoted disciple and also in giving deserved recognition to one of our number who, owing to his modest and retiring disposition, is not as widely known as he should be.

Here is, indeed, another "Alabama Student." Dr. Hill was well prepared for the study of medicine and evidently from the beginning determined to fit himself for the practice of surgery. It was not altogether a common custom for young men of our section to finish their medical education abroad, but Hill, after taking degrees at two good colleges in this country, repaired to London, where he spent six months in Lister's clinic, and then to the continent on a visit of more than a month to the best hospitals. His career, then, had an inception out of the ordinary. In truth he is a man out of the ordinary. He has been an outstanding man. His surgical skill, notable for accuracy and boldness, as with all pioneers; his studious habits and his fine ability to express himself; his high character and unswerving loyalty—all these

have marked Dr. Hill as a man of superior intelligence and ability.

Luther Leonidas Hill was born in Montgomery, Alabama, on January 22, 1862, the son of the Reverend Luther Leonidas Hill, Methodist minister, and Laura Sarah Croom Hill, both natives of Alabama. His original American ancestor, William W. Hill, emigrated from England to North Carolina in 1687. Dr. Hill lived on a farm about four miles out of the City of Montgomery from his infancy until the time he went away to college. His early education was acquired in the school of Professor George Thomas at Montgomery. He later went to Howard College, then at Marion, Alabama, but now at Birmingham, where he completed the junior academic year. He was graduated from the medical department of New York University in 1881 at the age of nineteen. He spent the summer of that year attending lectures at hospitals in New York City. He was also graduated in medicine in 1882 from the Jefferson Medical College, Philadelphia, where he went that he might attend the lectures of Samuel Gross. He attended the New York Polyclinic where he completed a course on the eye, ear, nose and throat. From October 1, 1883, to April 1, 1884, he

## Editorials

was at King's College Hospital, London, where he studied surgery under the instruction of Joseph Lister and John Wood. After visiting the principal cities of Europe, he returned to Montgomery, Alabama, and on May 15, 1884, began the practice of medicine there, specializing in surgery.

For five years Dr. Hill was surgeon of the Second Alabama Regiment of the National Guard and in 1910 he was made Surgeon General of the Alabama National Guard.

guished pioneer health officer of the State of Alabama. In 1913 he delivered this lecture, using as his subject "Surgical Complications and Sequels of Typhoid Fever."

Dr. Hill is now Grand Senior Life Counselor of the Alabama Medical Association. In 1897 he was President of the United States Board of Pension Examiners and in 1893 was President of the Montgomery Board of Health. For many years



Luther Leonidas Hill, M.D.

In 1910 he was appointed a trustee of the Alabama School for the Deaf and Blind. In 1887, he was elected President of the Montgomery Medical and Surgical Society. In 1888 he was elected counselor of the Alabama State Medical Association and in 1897 he became President of the Alabama State Medical Association, being one of the youngest, if not the youngest, ever to hold this position. As President of the State Association he originated the Jerome Cochran Lecture in honor of the distin-

he has been surgeon for the Mobile & Ohio Railroad. Since 1897 Dr. Hill has been visiting surgeon of the Laura Hill Hospital of Montgomery, an institution named in honor of his mother and owned and operated by him and by his brother, Dr. Robert S. Hill of Montgomery. For more than thirty years these brothers have been associated in the practice of surgery, Dr. Luther Hill doing the general surgery and Dr. Robert Hill the gynecology.

In 1902 Dr. Luther Hill reported the

first successful case, in America, of suture of the heart for a wound penetrating the ventricular cavity, and six years later he published a paper on Wounds of the Heart with a report of three cases. He wrote the section on Wounds of the Heart for the "Reference Handbook of Medical Sciences," of which contribution the publisher said: "We are very glad to report that the article of Dr. L. L. Hill, of Montgomery, Alabama, in the Third Edition was so highly thought of and received such favorable comment and is so nearly down to date at this time that it has been copied intact into the Fourth Edition of the Handbook." Dr. Hill is also author of many other notable contributions to surgical literature. He has been a student all his life and possesses one of the finest medical libraries in the country, as well as many volumes of general literature. It is an exceptional evening that Dr. Hill is not to be found in his library studying and reading until one or two o'clock in the morning. Suffering since his early manhood from otosclerosis with its ever increasing handicap, Dr. Hill has been denied much of the pleasure that comes from the contact and society of his contemporaries in the meetings of medical associations. The versatility of his knowledge, the wide range of his information and his ever ready and unfailing memory have, however, been the

source of much admiration and delight to his friends. In his library with his friends or with his pen the warmth of his nature finds true enjoyment. He has written many letters to his friends on many subjects as diverse as comments on the opossum and a review of Papini's "Life of Christ."

In 1910, the University of Alabama, in recognition of Dr. Hill's achievements as a surgeon, conferred upon him the degree of Doctor of Laws. In 1913 he was elected a fellow of the American College of Surgeons and in 1925 he was given the Phi Beta Kappa key by Alpha Chapter of the University of Alabama. Dr. Hill is a Democrat and is a member of the Sigma Nu Fraternity.

On July 12, 1888, Dr. Hill married Miss Lillie Lyons of Mobile, Alabama. They are the parents of four children: Mrs. Lillian Hill Rueker of Birmingham, Alabama, the wife of Dr. E. W. Rucker, an ear, nose and throat specialist of that city; Hon. Lister Hill, of Montgomery, Alabama; Miss Amelie Hill of Montgomery, Alabama, and L. L. Hill, Jr., of Des Moines, Iowa. Hon. Lister Hill was named by his father for Sir Joseph Lister and at the early age of twenty-eight years was elected to Congress where he still holds his seat. L. L. Hill, Jr. was graduated from the United States Military Academy at West Point in 1918.

HUBERT A. ROYSTER.



VIRGIL PENDLETON

**V**IRGIL P. GIBNEY, one of the pioneers of orthopedic surgery in America, and for nearly two generations its most distinguished representative, died on June 16, 1927.

Dr. Gibney was born in Jessamine County, Kentucky, on September 29, 1847; and had he lived three months longer, he would have completed his eightieth year. He received his early education in the south, being graduated with the degree of Bachelor of Arts, from the University of Kentucky in 1869 (A.M. in 1872). He then came to New York and entered the

GIBNEY, M.D., LL.D. 

Bellevue Hospital Medical School from which he was graduated in 1871. Soon after, he became associated with the Hospital for the Ruptured and Crippled, as Assistant Resident Surgeon. This was in the early days of the institution, for it was founded in 1863 and had only recently moved from a house on Second Avenue to its new home on the corner of Lexington Avenue and Forty-second Street. It was the only hospital in the country for the treatment of crippled children and for hernia. On the death of Dr. James Knight, in 1887, Dr. Gibney was appointed Surgeon

## Memorial

in Chief of the Hospital for the Ruptured and Crippled; and from that time until his retirement three years ago, he continued not only to direct the medical and surgical departments of the hospital but to render invaluable help in its administration. It is given to few men to serve the same hospital for an uninterrupted period of fifty-three years, and fewer still have been able to render any institution such invaluable service.

formed the habit of making careful histories of all the patients who came under his care. In later years when he began to publish contributions on orthopedic subjects, he was able to draw upon a vast amount of clinical material, and his papers always carried great weight because they were based upon facts gathered from personal observation rather than upon theories, however brilliantly conceived or ably presented.



Virgil Pendleton Gibney, M.D., LL.D. (1847-1927).

During the fifteen years from 1872 to 1887, Dr. Gibney was busily engaged in a clinical study of the great variety of bone and joint diseases and in correcting deformities resulting therefrom. He was one of the first to appreciate the very great value of plaster of Paris bandages in the treatment of orthopedic conditions, and he became remarkably skillful in applying them. Furthermore, he had a natural mechanical bent which was of the greatest aid in his work, and he devised many new appliances as well as improvements on older ones. During this period he wrote little, at least for publication, but early

Up to the time of his appointment as Surgeon in Chief of the Hospital for the Ruptured and Crippled, I can find but ten papers that he published in various medical journals. His first paper, in 1877, reported the death of two children from chloroform anesthesia. In the year following he brought out a paper on The Paralysis of Pott's Disease, Being a Clinical Study of Fifty-eight Cases. His paper on Perityphilitis in Children; Illustrating Points in the Differential Diagnosis of Hip Disease was published in 1881. From 1887 to 1890, a period of four years, he published fourteen papers. Among the more important

ones may be mentioned: Operative Procedures in the Bone Diseases of Childhood (1890) and Present Status of Congenital Dislocation of the Hip and the Bloodless Reduction (1903). His published papers numbered more than one hundred. They were of the utmost help to the general practitioner, all being very practical and all marked by brevity and lucidity.

Although Dr. Gibney began his surgical career in the pre-antiseptic era, he early recognized the great advantage of Lister's methods. Prior to 1887 the treatment of both orthopedic and hernia cases at the Hospital for the Ruptured and Crippled consisted almost solely in mechanical appliances. Dr. Gibney was quick to recognize that surgery had a distinct place in the treatment of these conditions, and that many cases theretofore treated by mechanical appliances would show better and more prompt results from operative treatment or a combination of surgical and mechanical methods.

Dr. Gibney was Professor of Orthopedic Surgery at the New York Polyclinic Medical School and Hospital from 1882 to 1894, when he resigned to accept the chair of Professor of Orthopedic Surgery at the College of Physicians and Surgeons, Columbia University, which he held until 1917. He was one of the founders and first President of the American Orthopedic Association, and was Vice President of the New York Academy of Medicine from 1902 to 1904. In 1899 the honorary degree of LL.D. was conferred upon him by his Alma Mater, the University of Kentucky.

He was a member of the Southern Society and of the Century and University Clubs.

In October, 1883, he married Miss Chapin of Springfield, by which marriage he had one son, Robert A. Gibney. In January, 1893, several years after the death of his first wife, he married Miss Julia Truby of Bridgeport, Connecticut, by which marriage he had two daughters,

Miss Susan Gibney and Mrs. Henry Patterson.

Dr. Gibney was highly fitted by nature for an orthopedic surgeon. He possessed unusual mechanical skill, and that degree of patience that can wait years for the results of treatment, so necessary in dealing with crippled children. He was, moreover, an indefatigable worker, and blessed with a physical endowment that never tired. He had a remarkable power or influence over his patients. They all worshipped him and waited early for his daily morning rounds, when his wonderful smile drove away their aches and pains and was often a greater factor in hastening their recovery than was surgical operation or mechanical appliance. Generations of house surgeons came and went and every one left with a feeling of great respect for Dr. Gibney's professional skill, and with a stronger feeling of friendship and affection that endured through all the years. In October, 1922, a banquet in honor of his fifty years of service at the Hospital for the Ruptured and Crippled was tendered him at the Hotel Commodore by more than four hundred of his colleagues, friends and admirers, many of whom came from distant parts of the country.

I cannot close this brief memoir without a personal note. I first met Dr. Gibney when House Surgeon at the New York Hospital, and from October, 1890, when I received an appointment in the Hernia Department of the Hospital for the Ruptured and Crippled, I came in almost daily contact with him. During this long period of more than thirty-five years, I came to know him well and to recognize the sterling qualities of his rare personality. Among these qualities one stands out above all others—the spirit of helpfulness and encouragement that he ever showed toward the younger men. He will be remembered long as a distinguished surgeon and a great teacher, but even longer as a loyal and devoted friend.—WILLIAM B. COLEY.

## BOOK REVIEWS

LISTER AS I KNEW HIM. By John Rudd Leeson, M.D. N. Y. William Wood & Co., 1927.

There have been two such excellent biographies of Lister published already that there would hardly seem room for a third. Dr. Leeson's book, however, fills a gap which is wanting in those of Godlee and Wrench. Leeson was a student and dresser in Lister's ward in Edinburgh at a crucial time in the history of his work and this intimate personal record is an invaluable story of the change in hospital conditions brought about by Lister's discovery. In 1871 Leeson had worked in St. Thomas' Hospital, London, in a new building, on a well-chosen site, and staffed with nurses trained by Miss Nightingale. It was supposed that here at last was a model hospital in which the septic diseases that decimated the wards in other hospitals would no longer prevail. Unfortunately the spectre of death marched through the new wards and patients died of pyemia, septicemia and hospital gangrene in the same proportion as they did in the old institutions. Dr. Leeson gives some of the reasons—the old dirty frock coat worn by the operator after having seen long service in the dissecting room; the "ward sponge" used in dressing one case after another and supposedly cleansed by wringing it out in a bucket of water between the dressings, and the filthy instruments kept in plush-lined cases. He describes the change in ward conditions which he witnessed when he left St. Thomas' to go to Lister's ward at Edinburgh. Although the ward was old and dark, the patients seemed cheerful and comfortable. The temperature charts at the head of the beds showed almost even lines of dots instead of the terrible jumps with which he was familiar on the charts of the septic patients at St. Thomas'. There was no odor except that of the carbolic acid so freely used by the great innovator who had wrought the change. Leeson gives an excellent account of the methods employed by Lister when he as his dresser took part in carrying them out. His description of the care with which Lister provided for the comfort of his patient, applying the dressings and splints himself, accompanying him back to the ward from the operating room in order to see that he was properly lifted from the stretcher and

placed in bed, and the cheerful words of encouragement with which he maintained his morale is well worth reading and taking to heart by surgeons of today. He throws a curious light on the relations, or lack of them, existing between Lister and his colleagues. The latter never visited his ward or showed the slightest interest in his work, nor did they ever ask him in consultation. Some of the junior surgeons, notably Miller, Bishop and Chienne, were won over at an early day and became enthusiastic advocates of the antiseptic method. Lister was a grave, formal man but his innate goodness of heart and genuine amiability are brought forth on every page of this book, as are his greatness as a teacher and inspirer of students and his modesty. He never hesitated to expose the occasional mistakes that he made and therefrom draw valuable lessons for the young men or the foreign surgeons who attended his classes. Dr. Leeson's book is of great practical value to the surgeon who is interested in studying the bridging of the gap which separates pre-antiseptic surgery from that of today. It is a most original and valuable contribution to the history of surgery in the nineteenth century, written at first hand by one who was capable of appreciating the magnitude of the revolution in which he took part. FRANCIS R. PACKARD.

A MANUAL OF GYNECOLOGY. By John Osborn Polak, M.Sc., M.D., F.A.C.S., Professor of Obstetrics and Gynecology, Long Island College Hosp., Professor of Obstetrics, Dartmouth Medical School. Ed. 3, 8vo. Cloth. \$5. Pp. 402; 145 engr., 12 col. pl. Phila. Lea & Febiger, 1927.

As in earlier editions this useful manual of gynecology emphasizes chiefly diagnosis and pathology and, by the judicious use of italics, stresses important points for the benefit of the student. Without materially increasing the bulk of the volume Polak has added a summary on the glands of internal secretion and has brought the work up to date by including important new literature. We found, however, only a passing reference in the text to the most important contribution that has been made to gynecological diagnosis in this century—Rubin's peruterine insufflation test



for tubal patency; and we could find no reference to it in the Contents or the Index.

#### THE DUODENAL TUBE AND ITS POSSIBILITIES.

By MAX EINHORN, M.D., Prof. Med., N. Y. Postgrad. Med. School. Ed. 2. 8vo. \$3. Pp. 206; 126 illus. Phila. F. A. Davis Co., 1926.

This elaborated edition includes the history and development of duodenal and intestinal tubage by its pioneer. Successive chapters deal with the tube and its congeners, the duodenal contents, diagnostic import of the tube, its therapeutic uses, and that of other instruments or the pylorous duodenum and small intestines.

DIE LEITUNGSBAHNEN DES SCHMERZGEFÜHLS UND DIE CHIRURGISCHE BEHANDLUNG DER SCHMERZZUSTÄNDE. By Prof. Dr. O. Foerster, Breslau. 8vo. Mk. 19.50. Pp. 360; 104 illus. Berl. Urban & Schwarzenberg, 1927.

This discussion of the pathways of sensory impulses is a careful presentation of old and new data, by a master of German neurological surgery.

In Part I, sensation is traced from the receptor to the brain. Part II is devoted to painful surgical affections of the nerves, root ganglia, nerve roots, cord, brain stem and cerebrum. The final chapter of fifty-five pages deals with headaches of different variety.

There is a splendid discussion of the dermatomes (Head's zones) and their disturbance in visceral disease. Serious students of neurosurgery can ill afford to neglect Foerster's essay.

An index would greatly augment the value of this book.

BIRTH INJURIES OF THE CENTRAL NERVOUS SYSTEM. Pt. I. CEREBRAL BIRTH INJURIES. By Frank R. Ford, Johns Hopkins Hosp. Pt. II. CORD BIRTH INJURIES. By Bronson Crothers and Marian C. Putnam. Harvard Med. School. Med. Monogr. xi. 8vo. Cloth. \$4. Pp. 164; illus. Balt. Williams & Wilkins Co., 1927.

This is a sample of the Medicine Monographs of which American Medicine may be proud. For scholarly marshalling of facts they rank with the best English tradition, while for exhaustive bibliographic research they are equal to the ideal of pre-war German erudition.

Surgeons, obstetricians, pediatricists and practitioners in general, in a distressing predicament,

will find in this volume the answer to surging queries. At times it will bring comfort, at other times, remorse, to the attendants at childbirth. Always it can be relied on for knowledge and direction in the prevention of accident and the care of those afflicted.

An important contribution by American medicine to obstetric practice, it should become a textbook in the schools and achieve a place with Kanavel's "Infections of the Hand."

The chapters include pathology, etiology and consequences, somatic and mental. Case reports are appended. An index would make this little volume even more useful.

THE INTERNATIONAL MEDICAL ANNUAL. A Year Book of Treatment and Practitioner's Index. Forty-Fifth Year, 1927. 8vo. Cloth. \$6. Pp. 560; illus. N. Y. William Wood & Co., 1927.

An exemplar of succinct presentation and judicious selection, well printed and illustrated, this compend of annual progress is eagerly welcomed in succeeding editions. Busy practitioners have in these volumes a useful and easily consulted presentation of improvements in technique and change of viewpoint.

MINERAL WATERS OF THE UNITED STATES AND AMERICAN SPAS. By William Edward Fitch, M.D., Asst. Gynec., O.P.D., Presbyterian Hosp., N. Y. 8vo. Cloth. \$8.50. Pp. 799; illus. Phila. Lea & Febiger, 1927.

This volume is an attempt at a scientific presentation of mineral waters of the United States and American spas. Part I deals with classification, contents, dosage and physiological action. Part II deals with cronootherapy or the use of mineral waters internally. Part III deals with balneotherapy and Part IV contains a list of the mineral springs of the country, arranged by the states alphabetically listed.

The book contains old-fashioned chemical analyses of the waters for their salt content, with much gossip information about railroads, hotels and "medicinal summaries." Thus, on page 492 "Medicinal Classification is, alkaline Ab, 2; strong saline, 1.3; strong sulphur or (Ab<sub>2</sub>, +Cl<sub>1.3</sub>, +S). The analysis shows this to be a very highly mineralized, thermic, sodic, muriated, sulphated and sodic and calcic bicarbonated saline (bromic, ferruginous) water, possessing diuretic, antacid, aperient, tonic and alterative properties," and so on. Of course such statements are extremely helpful

in prescribing. The final chapter tells of the important American spas and has beautiful illustrations of their hotels and equipment.

The reviewer has searched in vain for any discussion of pH or of buffer values in the waters and notes that the author omits all reference to recent epoch-making studies on water balance in the body. He prefers to rely on "clinical experience." Until clinical observations are checked by controls and the conditions of application analysed statistically, spas and mineral waters will have their great and useful place in the practice of medicine, but it will be a check on progress to consider that their application and study has become in the least bit more conditioned by modern science, than was their prescription by Hippocrates of Cos, or the aborigines of our own country.

A really scientific study of a single mineral water is sorely needed.

**TRANSFUSION OF BLOOD.** By Henry M. Feinblatt, M.D., Asst. Clin. Prof. Med., Long Island College Hosp. Brooklyn, N. Y. 8vo. Cloth. Pp. 137; 24 engr. N. Y. Macmillan Co., 1926.

A succinct account of the history and technique of blood transfusion is written with great emphasis upon the author's modification of the Unger instrument.

**BASAL METABOLISM IN HEALTH AND DISEASE.** By Eugene F. DuBois, M.D., Medical Director, Russell Sage Inst. Path.; Assoc. Prof. Med., Cornell Univ. Med. Coll., N. Y. Ed. 2. 8vo. Cloth, \$5. Pp. 431; 92 engr. Phila. Lea & Febiger, 1927.

That DuBois' book has required a second edition in a few years is witness to the importance of basal metabolism to practitioners. It is a tribute to the entertaining and thorough presentation of a pioneer and an authority in this field. The mark has grown with increased knowledge and can be recommended as an expression of the best scientific information and practice.

Only a few years ago the study of basal metabolism seemed a clinical laboratory procedure which only the elect might achieve. Today, surgeons and physicians accept the

findings of technicians and employ them in diagnosis with the assurance given to a blood count or a temperature reading.

DuBois presents in Part I, Metabolism in Health, in Part II Metabolism in Disease. Chapters of the latter treat of undernutrition and overnutrition or obesity, diabetes, metabolism in relation to thyroid, adrenal, pituitary and sex glands, diseases of the blood, heart and kidneys, fever, water metabolism, the influence of nervous system and of drugs. There is an excellent index.

## BOOKS RECEIVED

**PRACTICAL OTOTOLOGY.** By Morris Levine, M.D., Assoc. Prof. of Otology & Assoc. Attend. Otologist, N. Y. Post-Grad. Med. School & Hosp. 8vo. Cloth. \$5.50. Pp. 387; 145 eng., 3 col. pl. Phila. Lea & Febiger, 1927.

**FUNDAMENTALS OF THE ART OF SURGERY.** By John H. Watson, M.B., C.M. (Lond.), F.R.C.S. (Eng.); Surgeon, Victoria Hospital, Burnley. 8vo. Cloth. \$6. Pp. 349; 65 illus. N. Y. Paul B. Hoeber, Inc., 1927.

**TROPICAL SURGERY AND SURGICAL PATHOLOGY.** By Karuna K. Chatterju, F.R.C.S.I., Surgeon, Medical College Hosp., Calcutta. 8vo. Cloth. \$6. Pp. 224; 91 pl., 5 charts. N. Y. William Wood & Co., 1927.

**LES CANCERS DU SEIN.** By Pierre Delbet, Prof. de Clinique Chirurgicale, Faculté de Méd. de Par. 8vo. Paper. 50 Fr. Pp. 343; illus. Par. Masson et Cie, 1927.

**DIAGNOSTIC DES PRINCIPAUX CANCERS.** By Henri Hartmann, et al. 8vo. Paper. Price, 10 Fr. Pp. 64; 10 figs. Par. Masson et Cie, 1927.

**HANDBUCH DER BIOLOGISCHEN ARBEITSMETHODEN.** Ed. by Geh. Med.-Rat. Prof. Dr. Emil Abderhalden, Direktor des Physiologischen Institutes der Universität Halle a.d. Saale. Pt. 5. Methoden zum Studium der Funktionen der einzelnen Organe des tierischen Organismus, Pt. 1, No. 4. 8vo. Paper. Pp. 161. Berlin: Urban & Schwarzenberg, 1927.

**DIE CHIRURGISCHE BEHANDLUNG DER GEHIRNTUMOREN.** Eine Klinische Studie. By Dr. Herbert Olivecrona, Privatdozent Oberarzt an der chirurgischen Universitätsklinik in Seraphimerkrankenhause, Stockholm. In collaboration with Dr. E. Lysholm, Chefarzt der Röntgenabteilung des Krankenhauses Mörby, Stockholm. 8vo. Pp. 344; 288 illus. Berl. Julius Springer, 1927.

**CYSTOSCOPY.** A Theoretical and Practical Handbook Containing Chapters on Separate Renal Function and Pyelography. By James B. Macalpine, F.R.C.S. (Eng.); Honorary Surgeon and Surgeon in Charge of Genito-Urinary Dept., Salford Royal Hosp., Manchester. 8vo. Cloth. 57. Pp. 284; 181 illus., 12 col. pl. N. Y. William Wood & Co., 1927.



# PROGRESS IN SURGERY

*Selections from Recent Literature*

KATZENELNBogen, S., Geneva. Synthalin in the treatment of diabetes. (La synthaline dans le traitement du diabète). *Rev. méd. de la Suisse Rom.* April 25, 1927, xlvii, 348.

Following the work of Frank of Breslau, the author has undertaken the clinical study of synthaline. Synthaline is a drug belonging to a group of substances closely allied to hexylenamine guanidine. The exact mode of action is not yet known. It is, however, known that it acts to reduce sugar in blood and urine and to combat acidosis. Approximately 1 mg. of the drug causes the disappearance of 1.2 mg. of sugar in the urine. It may be used in conjunction with insulin. When given alone, it is administered by mouth in coffee, tea or soup. It is well to begin with a dose of about 10 mg. If this proves harmless, the regular treatment is started. Because of the delayed effect and the tendency to cumulative action, the author advises giving the drug in one of the following manners:

1. On each of two days, 20 mg. of the drug are given morning and evening. The third is a rest day. On the fourth day the series is repeated.

2. The first day 20 mg. are given morning and evening, the second day 20 mg. are given in the morning only. The third day 20 mg. are given in the evening only and on the fourth day another 25 mg. are given in the evening. The fifth day is a rest day.

3. Two doses are given on the morning and evening of the first day. The second day 20 mg. are given in the morning, the third day 20 mg. are given morning and evening and the fourth day is a rest day.

In this manner, the amount of drug given is varied to meet the conditions. The drug may produce severe secondary reactions, such as anuria, various gastrointestinal upsets etc. These secondary reactions cease immediately upon withholding the drug. The exhibition of atropine may markedly reduce tendency to dyspepsia and calcium carbonate may aid in reducing the ill effects upon the vegetative nervous system.

The author comes to the conclusions that synthaline is of value in reducing the blood sugar and in causing a reduction and disappear-

ance of sugar and acetone in the urine. Because of the toxic effects of the drug, it is advised that no more than 120 mg. be given in the course of the first four days. Such doses will cause a reduction of 30 to 40 grains daily. Because of the relatively slow action of the drug, it cannot supplant insulin in cases of diabetic coma but it will prove of distinct value in the milder cases of diabetes where prolonged hypodermic injections can be avoided.

BÉCLÈRE, A. Successful roentgen treatment of a pulsating apparently sarcomatous neoplasm of the sacrum. *Strahlentherapie*, 1926, xxi, 561-566.

The case described, occurring in a girl aged thirteen, is a striking example of the remarkable effects of roentgen therapy on certain neoplasms of the osseous system, especially the spinal column.

Four months previously the child suffered a painful fall upon the buttocks. After this accident increasing painful symptoms developed in the legs and over the sacrum. After a while the original site of trauma developed a pulsating tumor which was painful. A test puncture of the tumor revealed pure blood and no signs of abscess. The roentgenogram of the pelvis showed the iliac bones practically normal and almost complete absence of the shadow of the os sacrum except for one or two shadows remaining in the median line. This indicated that if there was no destruction of this bone there was at least almost complete decalcification.

The various symptoms and the course of the condition led to the diagnosis of a malignant tumor of the os sacrum. In all probability it was a sarcoma belonging to the group of telangiectatic bone sarcomas characterized by a pulsation isochronic with the pulse. A test excision seemed to be contraindicated; likewise any attempts at operative removal of the tumor. Roentgen therapy seemed to be the only recourse and the patient received the following irradiation: 200 kv. (40 cm. spark gap), 3.5 ma., 0.5 mm. Zn plus 2 mm. Al, skin focal distance 30 cm., field of exposure 15 X 15 cm. Four such treatments were given at intervals of 48 hours, the surface received at each treatment a dose of 1000 roentgen units (measured with the Solomon ionometer). Distinct improvement became evident fourteen days after the last

treatment. The patient received another series of four treatments as above administered about a month after the beginning of the first series. The patient was discharged and when seen again three months after termination of the last treatment all symptoms had disappeared and the girl was as active as ever. The roentgenogram showed reappearance of the os sacrum, somewhat deformed and not quite complete. The menses had appeared once before the occurrence of the accident and have not reappeared since. It is to be feared that these will not return, since the ovaries of necessity had to be included in the zone of irradiation. However, the mammae and pubic hair appear to be developing normally which suggests that the secondary sex characters are developing as if the ovaries, despite interruption of their normal menstrual function, still retained their endocrine activity. There is no justification for calling this a cure in view of the short observation, and the case must be studied further.

MENEES, THOMAS O. Intra-gastric radium treatment of carcinoma of the stomach. *J. Am. M. Ass.*, June 19, 1926, lxxxvi, 1904-1905.

The application of radium immediately to the growth has definite advantages over external roentgen therapy alone in the treatment of gastric carcinoma. For accurate placing of the radium, both tube and tumor must be visualized. The radium tube in the stomach is readily visible under the roentgenoscope but the tumor is invisible without a contrast medium. With the usual contrast medium the tube is lost in the barium shadow. This suggests the use of air as it will contrast both. The air must be confined, to keep it under control and prevent it from rising to the highest point of the stomach.

To meet these requirements the author employs a rubber balloon cemented to a small rubber tube. The radium on a flexible wire coil is placed inside this and the bulb of a sphygmomanometer is attached to the other end of the tube. This applicator when passed into the stomach and distended gives a clear outline of the radium tube and the carcinomatous filling defect. The spiral wire carrying the radium is attached to the piston of a syringe so that any movement of the piston is transmitted to the radium tube at the other end of the spiral, and the radium can be pushed around and placed at the desired point. It is important to determine the position of the radium in three planes without moving the patient and displacing the radium, hence an arrangement should be made for roentgenoscoping the patient in several planes without the position of the patient being changed.

The radium is lightly filtered (0.5 mm. silver) to obtain the greatest surface effect and to minimize the time of application. The treatment is divided into short sessions of one to three hours daily and continued until all of the accessible surface of the tumor has been covered. Radium cannot be satisfactorily placed in all cases by this method. Where the lumen is much narrowed or tortuous it may be impossible.

Since the majority of gastric cancers are relatively insensitive to radiations, this method is practically only palliative. It is of value in slowing the rate of growth and relieving pain and hemorrhage. Probably, the greatest value is in opening up the narrow portions of the stomach by destruction of the surface of the tumor and preventing an obstruction with its violent train of symptoms. There is also an increased fibrosis of the deeper portions of the tumor with restraint of growth and obliteration of blood vessels. Complete retrogression of the tumor is to be expected only in highly cellular anaplastic growths which are not too extensive. Since the method is practically palliative, it is no competitor of surgery but rather a complement. The pyloric growths accessible to surgery are the most difficult to apply radium to accurately. With the less surgically accessible, cardiac growths it is much easier to place radium.

NOVAK, EMIL. The treatment of functional uterine hemorrhage. *J. Am. M. Ass.*, April 10, 1926, lxxxvi, 1105-1107.

The methods of treatment of functional ("idiopathic" or "essential") uterine hemorrhage include organotherapy, repeated curettage in recurrent cases in young women, radiotherapy, especially in patients at the menopause, and hysterectomy at menopause under certain conditions. A certain number of mild cases appear to correct themselves spontaneously.

It is essential that no other diagnosis should be entertained in such cases until the possibility of malignancy has been excluded and for this reason the diagnostic curettage is necessary. In no other way can the nature of the trouble be established. Especially distinctive is the finding of hyperplasia of the endometrium. Only by diagnostic curettage can one exclude the existence of adenocarcinoma of the corpus. In most cases curettage will be followed by relief from the hemorrhage and in many cases this relief will be permanent.

In women who have lived their reproductive lives and in whom the matter of further child bearing need not be considered or at any rate is distinctly subordinate to that of health, the

indication is clear for radiotherapy. This is the almost ideal indication for radium in gynecology, for menstruation can be checked promptly and with certainty. In uncomplicated cases there would seem to be no reason for hysterectomy where radiotherapy is available. In cases, however, in which there is some associated lesion indicating laparotomy, hysterectomy is a perfectly justifiable and effective procedure so far as correction of the bleeding is concerned.

SCOTT, ARTHUR C., JR. Cauterization and cautery excision of cancer. *J. Am. M. Ass.*, Oct. 9, 1926, lxxxvii, 1188-1193.

The theory of cauterization is sound except that its practice results in mass destruction of tissues, and the quantity of radiated heat applied at every point where it may be needed is an uncertain element. Although this heat is measurable, in actual practice it is not measured in every case. The method of choice in cauterization at the present time is to use the cautery at a white heat whenever the situation of the tumor will permit. This cannot always be done, however, in certain situations around the eye and in other regions. Cosmetic considerations are coming to be considered less and less where malignant growths are involved.

Freedom from local recurrence for a period of three years should be the criterion of the effectiveness of a particular method of local treatment for surface and readily accessible subsurface malignant growths. On this basis, the cautery excision operation and the cautery gland dissection are found more efficacious than the direct cautery operation. Either of the cautery methods is superior to the knife operation or other local methods of treatment of superficial cancers. The curability of surface and readily accessible subsurface malignant growths has been substantially increased by the cautery excision and cautery gland dissection operations.

Of 1000 cases studied since 1906, nineteen of the cases had to be discarded because of insufficient data. The 981 remaining cases are divided into three main classes: cauterization operation cases, 308; cautery excision operations 482, and cautery gland dissection with excision, 191. The operative mortality in the entire series was 0.4 per cent. There were 469 cases living five years or longer after operation; and 617 three years or longer after operation.

In the group of traced cauterization cases in which operation was done three years or longer previously there were 6.6 per cent with local recurrences. In the cautery excision operations there were 3.5 per cent cases with local recurrences present three years or longer

after operation. In the cautery gland dissection group there were 3.7 per cent with local recurrences.

DAVIS, JOHN STAIGE. The treatment of deep roentgen-ray burns by excision and tissue shifting. *J. Am. M. Ass.*, May 8, 1926, lxxxvi, 1432-1435.

When a deep roentgen-ray burn occurs and the ordinary local methods have been tried for a reasonable time, nothing is gained by delaying operative work. In fact delay in radical treatment may be dangerous as malignant degeneration is not uncommon in certain types of these burns. In none of the cases referred to the author has treatment with ultraviolet and other radiations been beneficial. Early excision of deep burns with tissue shifting promises more surely than any other method yet devised a reasonable prospect of permanent relief in a comparatively short time. Pain is eliminated and in many instances function is restored, and patients who have been incapacitated for years have been returned to their former activities. The ultimate results have been gratifying.

Excision with tissue shifting is also the procedure of choice in chronic deep radium burns and ultraviolet burns, and promises a quicker and better result than any other method.

In the ideal case the ulcer and the surrounding area of induration should be excised out to and down to healthy tissue. In many instances, however, complete excision is impossible on account of the extent and situation of the burn, but in these cases the excision should be as radical as the circumstances will permit.

When the exposed tissues seem normal and the excision has been complete grafting may occasionally be performed immediately. In the majority of instances following the excision of deep old burns there is a general oozing which it is almost impossible to check. In these cases one must wait until granulations begin before grafting is performed. The type of graft used depends on the location of the lesion.

GRAHAM, ALLEN. Exophthalmic goiter and toxic adenoma. *J. Am. M. Ass.*, Aug. 28, 1926, lxxxvii, 628-631.

It is commonly held that exophthalmic goiter and toxic adenoma are two separate disease entities. There is, however, not a single symptom or sign that can be recognized as necessarily pathognomonic for exophthalmic goiter as opposed to toxic adenoma. There is not a single anatomic or histologic alteration in the thyroid in either the adenomatous or the non-adenomatous portion of the gland that is

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necessarily pathognomonic for exophthalmic goiter as opposed to toxic adenoma.

There are equally good reasons for speaking of dysthyroidism in both these diseases. The degree of hypertrophy and hyperplasia of the thyroid determines the quantity of iodine that will be tolerated without untoward effects in both exophthalmic goiter and toxic adenoma. In both of these the reaction to iodine is fundamentally the same.

There therefore remains no alternative but to regard exophthalmic goiter and toxic adenoma as clinical variations of a single morbid state.

RUCKER, M. PIERCE, Richmond, Va. Pneumonia as a sequel to anesthesia. *Am. J. Obst. & Gynec.*, June, 1927, xiii, 764.

A study of the literature, some of which is quoted, seems to indicate that the term "ether pneumonia" is a misnomer. In fact anesthesia probably plays a minor rôle in the causation of postoperative lung complications except that it permits extensive operative procedures upon septic and debilitated patients. After due allowance is made for aspiration of septic material, the lighting up of a preexisting process in the lungs, the chilling of the patient on the table and before he recovers consciousness, there remain a considerable number of pneumonias and pleurisies that are best explained by septic material from the operative field lodging in immobilized lung tissue.

FLAGG, PALUEL J., New York. Intratracheal inhalation. Preliminary report of a simplified method of intratracheal anesthesia developed under the supervision of Dr. Chevalier Jackson. *Arch. Otolaryngol.*, May, 1927, v, 394.

This safe, improved and simplified intratracheal method for general anesthesia is offered for all operations about the head and neck. The method provides a dry, quiet, odorless field of operation, with increased safety to the patient.

The safety of an indwelling tracheal tube with a lumen sufficient to meet respiratory needs may be considered as satisfactorily solved. The size of tube for a man is 38 F.; that for a woman is between 32 F. and 34 F.

Flagg has proved the safety and efficiency of a simple intratracheal method for anesthesia. The disadvantages of the method are: the necessity of intubation by direct vision and the presence of the intratracheal tube in the mouth.

The following advantages are enumerated:

(a) Elimination of complicated motor-driven apparatus, manometers and devices for warming and heating the vapor; an operating field free from escaping insuflated vapor; an operative field free from anesthetic; normal respiratory rhythm and amplitude; conservation of carbon dioxide; exclusion of foreign matter such as, blood and vomitus, and ability to maintain the lightest anesthesia.

(b) Complete control of artificial respiration by the simplest methods.

(c) A technique which makes available the maintenance of anesthesia by ether, gas and oxygen, ethylene or any combination of these agents.

(d) Protection from external pressure on the trachea.

(e) A method for operations on the nose and throat which gives a field resembling that offered with the use of chloroform, with the safety of a light ether anesthesia, and protection against the aspiration of blood.

(f) A field of practical asepsis for plastic operations on the face.

ROSENBLATT, MILLARD S., Detroit. Traumatic cyanosis—its pathological physiology. *Ann. Surg.*, June, 1927, lxxxv, 801.

A case of traumatic asphyxia with recovery is reported.

The prognosis is good if the trauma is not fatal shortly after its occurrence.

The cyanosis of the head, face and neck, with subconjunctival hemorrhages is characteristic of the condition. The distribution of cyanosis is probably due to incompetent or absent valves of the region, allowing back pressure produced by compression of the superior vena cava to cause a distention of, or a paralysis and a stasis in, the small vessels.

VAQUEZ, H. and YACOEL, J. Non-diabetic stenosing arteritis. (*Artérites sténosantes non diabétique*). *Presse méd.*, May 18, 1927, No. 40, 625.

The authors review the field of arteritis and classify arteritis as being due to trauma, infections, diabetes, trophic disturbances, atheromatous changes. The so-called thromboangiitis obliterans is placed by them in a separate category of non-specific chronic obliterating endarteritis of juvenile type. So-called Buerger's disease is to be looked upon not as a separate disease entity but merely as the acute stage of



the disease previously described by others. In the chronic stage of the disease, the symptoms of intermittent claudication and gangrene are seen. Being guided by the results obtained by other writers in the treatment of coronary arteritis and of varicose ulcers, the authors attempted the insulin treatment of these types of juvenile non-diabetic obliterating endarteritis. Four cases are reported. All showed marked improvement in symptoms and one even showed a reestablishment of the pulsations as determined by the oscillometer. The insulin is given in 15 unit to 20 unit doses daily over a period of about twenty days. After a rest of about ten days, a second and if necessary other series of treatments are given. The authors refer to the excellent results obtained by Phillips and Tunick by means of roentgen ray applied to the spine.

PERMAN, EINAR, Stockholm. On circulatory conditions in arterial embolism of the lower extremities. *Acta chir. Scandinav.*, May 25, 1927, lxi, 441.

A certain distribution of symptoms of disturbed circulation does not correspond to a definite localization of an embolus. The clinical picture may vary considerably in different cases for the same localisation of the embolus. In many cases these variations are accounted for by different development of the collateral circulation. This is particularly the case where there is no secondary thrombosis.

On the proximal part of the thigh there are powerful communications between the internal iliac and the deep femoral arteries. On the distal part of the thigh there are connections between the latter arterial system and the superficial femoral group of arteries. In obstruction of the popliteal artery there are possibilities of collateral circulation partly in the arterial system of the knee-joint, partly in that of the calf-muscles, on account of the anastomotic branches existing between the sural arteries and branches from the posterior tibial artery. All these anastomotic communications and their great importance for the collateral circulation are easily demonstrated radiologically. Anatomical investigations have proved these vessels to be macroscopic and easily visible in the adult and sometimes of great size.

The author relates two cases operated upon. In one of them, a woman eight months pregnant with an embolus at the aortic bifurcation, an attempt to reestablish the circulation did not

meet with success. In the second case where the embolus was situated at the division of the femoral artery the circulation was reestablished.

CANNON, A. BENSON, and LOWENFISH, F. PHILIP, New York. Varicose ulcers of the leg. Treatment with thrombosis and gelatin cast bandages. *Arch. Dermat. u. Syph.*, June, 1927, xv, 647.

The treatment of varicose ulcers of the leg by means of thrombosing the veins with a solution of sodium salicylate, and the application of Unna's zinc gelatine glue bandages was very beneficial in a group of 82 patients. Thirty-four, or 41 per cent, have been discharged as cured. In 18 of the discharged patients the veins were thrombosed and the cast was applied, while in 16 the cast alone was applied. This showed that the percentage of cures with the veins thrombosed and the cast applied about equaled that of cures when the cast alone had been applied. In those patients remaining under treatment the ulcers show from slight to marked improvement.

RAND, CARL W., Los Angeles. Chronic subdural hematoma. Report of seven cases. *Arch. Surg.*, June, 1927, xiv, 1136.

Cases of chronic subdural hematoma are more frequent than has commonly been supposed. The relatively long period that may elapse from the initial trauma until the development of pressure symptoms frequently leads to overlooking of the injury as a causative factor. While the trauma may be insignificant, this is not always the case. The importance of possible preceding trauma in all cases of obscure increasing intracranial pressure should be emphasized.

All cases of chronic subdural hematoma in this series showed a decidedly high pitched percussion note over the calvarium. The note does not appear to be higher on the side of the hematoma.

The results of the spinal fluid examination vary, depending on the interval which has elapsed since injury. Practically all cases, regardless of time, show some increase in spinal fluid pressure. The color at first is usually "smoky" or blood-tinged, later becoming yellow, straw-colored or perfectly colorless. Instances of each condition have been encountered in this series. There may be an increase in cell count and globulin content of the fluid—or both may be normal. Choked disk is usually



present and is frequently more advanced on the side of the hematoma.

Chronic subdural hematoma may occur from childhood to old age. The origin of the hemorrhage in certain instances seems to be from the pial veins or venous radicals of the longitudinal sinus.

While an osteoplastic flap and removal of the hematoma—both linings and contents, as suggested by Putnam—may be the method of choice, it is not unlikely that any operative procedure such as decompression, with evacuation of, or simple trephining and aspiration of the contents of the hematoma, will yield good results. The principle thing after all is to empty the hematoma. It seldom, if ever, refills, although the fate of the lining membrane is an open question.

BRICKNER, WALTER M., New York, Brachial plexus pressure by the normal first rib. *Ann. Surg.*, June, 1927, lxxxv, 858.

There are cases of pain in the arm, with paresthesias and other phenomena, that are relieved by elevating the shoulder and by exercising the trapezius to keep it elevated. These cases, of which three are reported, are probably due to dragging of the brachial plexus over the first rib.

There are more severe cases in which all the phenomena of pressure by a cervical rib are produced by the pressure of an abnormal or even a normal first thoracic rib. Several have been cured by resection of the first rib. The technique of the operation is described.

When operating upon a case of cervical rib it is important to observe whether the pressure to be relieved is due to this supernumerary, or to the normal first, rib.

Two cases are reported of intermittent severe pain and edema in one upper extremity, occurring in adolescent females and perhaps due to plexus pressure by the first rib.

ADSON, ALFRED W., and COFFEY, JAY R., Rochester, Minn. Cervical rib. A method of anterior approach for relief of symptoms by division of the scalenus anticus. *Ann. Surg.*, June, 1927, lxxxv, 839.

In the transcervical or the postbrachial approach, the surgeon is usually content with elevating the brachial plexus and removing the rib, or as much of it as is possible, from behind, without exposing the scalenus anticus muscle, the subclavian artery, or other tissues in front.

Because of the occasional postoperative palsy which ensued and the greater ease in operation, Adson was persuaded to adopt the anterior approach, in which the clavicular attachment of the sternocleidomastoid muscle is reflected to expose the scalenus anticus muscle, the subclavian artery, and the brachial plexus. One can readily observe the pressure produced by the scalenus anticus muscle when the neck is extended backward or the head is rotated toward the affected side.

After having removed several ribs according to this technique, and having studied the mechanics which produce the symptoms, the authors were convinced that, with the exception of one case referred to, removal of the cervical rib was really unnecessary, inasmuch as the subclavian artery and the brachial plexus were immediately relieved from pressure and irritation upon severance of the scalenus anticus muscle from its insertion. The latter procedure was much less difficult and more effective since the subclavian artery was then permitted to recede and take on its normal size, provided operative treatment was instituted before any permanent change had taken place. All traction on the brachial plexus is removed by the tenotomy of the scalenus anticus muscle.

The ulnar nerve rides over a bony prominence where it is constantly subjected to motion without symptoms being provoked; there should be no more likelihood of symptoms arising in the brachial plexus when it merely lies on the cervical rib, with little or no motion and no traction on it. Accordingly, the authors have operated on four patients by means of the anterior approach, dividing the tendinous attachment of the scalenus anticus muscle without removing the cervical rib; symptoms were completely relieved.

COLT, G. H., Aberdeen. The surgical treatment of the "de-gloved" hand. *Brit. J. Surg.*, April, 1927, xiv, 560.

The author reports two cases in which the skin of the hand and fingers was torn away leaving functioning fingers behind. In the majority of cases, these fingers become stiff as a result of adhesions and ultimately come to amputation. The cases here reported were restored to a considerable degree of usefulness by the procedure which the author describes. Essentially this consists merely in the making of pedicle flap grafts from the thigh or abdomen.

But the author discusses in detail the manner in which the size of the grafts is to be estimated as well as other technical details looking to the favorable outcome of the treatment. He suggests for this injury and its operative treatment the term "cheiro-daetylo-dermaplasty."

BALFOUR, DONALD C., and HARGIS, ESTES H., Rochester, Minn. Cancer of the stomach. *Am. J. M. Sc.*, June, 1927, clxxiii, 773.

A series of 1000 cases of cancer of the stomach forms the basis of a review of the general problem of this disease. Change in gastric acidity and symptoms of obstruction are inconstant in the early course. The roentgen ray provides an almost infallible method of diagnosis and should always be used.

Unless there is clear evidence of metastasis, operation is justifiable. Exploration at least was undertaken in more than half the series, and in almost half of these the growth was removed. Obesity, anemia, rapid loss of weight and youthfulness of the patient add to the risk of operation and diminish the prospect of cure.

The liberal administration of food and fluids combined with rest in bed, and the intravenous use of sodium chloride and glucose before operation tend to minimize the risks and enhance the prospects of a good result.

Regional anesthesia will suffice for incision and exploration, but general anesthesia is necessary for a difficult resection, especially if the patient is apprehensive.

The types of resection are discussed and preference given to gastrojejunal anastomosis, which should be carried out in the anterior position when the gastric stump is small. The latter operation should be combined with jejunostomy. No food is given for several days after operation, and fluids are administered extraorally. Lavage of the stomach is desirable, even as a routine on the first day.

The operative mortality is much improved by the preoperative care and by cooperation with the physician. To illustrate this fact reference is made to a series of 46 consecutive cases of partial gastrectomy for cancer of the stomach with death in 1, and to the entire series in 1926, in which death occurred in 8 of 120 cases of partial gastrectomy for cancer.

The end-results in the series of 1000 cases are discussed: If the lymph nodes were not involved 52 per cent of the patients were alive

at the end of three years, otherwise only 19 per cent of them survived that long.

BOLTON, CHARLES and SALMOND, R. W. A., England. Antiperistalsis of the duodenum and its relation to pyloric regurgitation. *Lancet*, June 11, 1927, ccxii, 1230.

Bolton says that antiperistalsis is a normal movement of the duodenum. Its effects are to delay the food in the duodenum, to ensure its admixture with the digestive juices, and to produce conditions favorable to regurgitation into the stomach.

The duodenal cap is filled periodically from the duodenum, the pyloric sphincter preventing regurgitation into the stomach.

In addition to its function of regulating the output from the stomach the pyloric sphincter prevents regurgitation from the duodenum in the early stages of digestion; as digestion proceeds it commences to relax independently of gastric peristalsis, promotes regurgitation, and thus regulates the acidity of the gastric contents.

An actual swing back of food from the second part of the duodenum is not always necessary to produce regurgitation, since a full cap with a momentary relaxation of the pylorus will produce it.

SHAINÉ, MARKS S., New York. The treatment of chronic constipation. *Am. J. M. Sc.*, June, 1927, clxxiii, 814.

A method is advocated for the treatment of chronic spastic constipation by dilatation of the lower intestinal tract with a sigmoidoscope and rectal tube.

In more than 100 cases it has proved successful in all but 2 or 3 cases, where it was impossible to introduce the sigmoidoscope the necessary distance.

This treatment is advocated only in cases where treatment by diet, by mineral oil and by oil injections has proven ineffective. A roentgen-ray examination must be made to exclude organic obstruction.

BARROWS, DAVID NYE, New York. Primary carcinoma of fallopian tube, with report of three cases. *Am. J. Obst. & Gynec.*, June, 1927, xiii, 710.

Though the age incidence of carcinoma of the fallopian tubes is largely between forty and fifty, we must watch for it in adults. Grossly,

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it frequently cannot be differentiated from chronic inflammatory lesions if removed intact. Radical extirpation, including all near-by palpable lymph glands, is the procedure recommended by most writers. The frequency of this growth requires our attention in all cases of apparently inflammatory pelvic disease. The diagnosis is usually established only by histologic examination. Incomplete removal of the pelvic contents is not a satisfactory method of treatment.

HURD, RALPH A., New York. Results of operations for retroversion. *Am. J. Obst. & Gynec.*, June, 1927, xiii, 742.

The observations made in the course of this study may be summarized as follows:

1. Retroversion as seen and treated at the Woman's Hospital is most often complicated by an accompanying inflammation of the cervix or adnexa with resulting peritoneal adhesions which restrict or even completely inhibit the mobility of the corpus.

2. In very few or no instances can the operator be accused of unwarranted surgery in this group of cases. Even in the patients whose uteri were freely movable, a definite complaint was present, and in over 90 per cent of these distinct improvement followed correction of the malposition.

3. The percentage of all retroversions which produce symptoms cannot be determined from a group such as this, for all these women, except possibly a few who came for sterility, presented definite complaints before operation.

4. Abdominal pain of various types and degrees appears to be a more constant symptom in retroversion than the time-honored backache, although the latter also appears in a large proportion of cases.

5. Retroversion, more than almost any other gynecologic lesion, is an affection of the child-bearing period.

6. Only 4 per cent of a large series of patients with retroversion complained of sterility, and more than half of these had also inflammation of the adnexa. Pregnancy followed operation, roughly, once in 4 cases.

7. The series shows 96 per cent of anatomic cures throughout the period of observation, which averaged twenty months, speaking well for the present-day method of handling this condition.

8. There appears but little to choose between

the several varieties of round ligament suspension as far as mechanical end-results are concerned. Of the operations frequently done, Bissell's yielded the lowest and Gilliam's the highest percentage of recurrences.

9. The plication of the uterosacral alone was distinctly unsuccessful in the few such cases done, although they are probably valuable adjuncts in other suspension methods.

10. End-results of retroversion operations considered symptomatically, appear to depend largely upon the symptoms which the lesion produces. One may expect a higher proportion of cures when the patient enters for pain, backache, or other discomfort than when she applies for relief of sterility or some disorder of menstruation.

11. That the reconstructed supporting ligaments of the uterus can undergo evolution during pregnancy is demonstrated by the paucity of spontaneous abortions in women who have undergone operation.

12. A full-term pregnancy was followed by a recurrence of retroversion in a previously-suspended uterus, roughly, but once in seven cases.

CHARLTON, H. R., Bronxville, N. Y. Prevention of carcinoma of the cervix. *Am. J. Obst. & Gynec.*, June, 1927, xiii, 755.

In most cases applying for diagnosis and treatment, the presence of leucorrhea means cervicitis of greater or lesser degree. At any period of life, in all social states, it is the most common disease brought to the attention of the gynecologist, and constitutes the main pelvic reason for leading women to consult physicians. It constitutes the classic example of a predisposing cause for a malignancy which is a very serious source to women. Chronic cervicitis may regularly precede cervical carcinoma. It is a curable or removable disease. Let every chronically infected cervix be approached, not as a cervical catarrh, not as an hypertrophy, not as a laceration, but as the prologue of an epithelial drama whose curtain may be a malignant death.

FRAENKEL, L., Breslau. The principles of the treatment of genital prolapse. The technique of ventrofixation of the vagina. *Am. J. Obst. & Gynec.*, June, 1927, xiii, 757.

In the surgical cure of genital prolapse, the suspension operations may be considered the best principle but, Fraenkel says, the vagina

and not the uterus should be suspended, even if a total prolapse of the uterus should be coexisting.

**Technique:** The uterus is pulled upwards and outward; transverse incision 2 cm. to 3 cm. long in the vesicouterine fold; separation of bladder downward beyond the vaginal fornix. A suture armed with needles at both ends is now inserted through each half of the vaginal vault to right and to left. Each end is carried forward through (1) the visceral peritoneum (2) the parietal peritoneum, (3) the external oblique muscle, (4) the abdominal fascia, and (5) the skin. The ends are then securely tied over a small gauze pad, so that the anterior vaginal vault is in broad and firm contact with the abdominal wall. The vesicouterine pouch is closed. The abdominal wall is sutured in four layers. The duration of the operation is twenty minutes. It does not matter whether the suture enters the lumen of the vagina or only penetrates the vaginal wall. The suture should be nonabsorbable and is removed on the fourteenth day, after a fibrous scar has formed in the suture canal.

The following objections may be made to this procedure: (1) The vagina is forced directly upward to the anterior abdominal wall; it separates the bladder in two and prevents distention and filling in the median line. The disadvantage is transitory. About 25 per cent of the patients complain of ischuria or strangury following the operation. The symptoms invariably disappear within a few days spontaneously and, after application of a permanent catheter, immediately. Thereafter the capacity of the bladder is not lessened, because the lateral parts expand. Permanent difficulties have never been seen. (2) The vagina is fixed. This might interfere with (a) cohabitation, or (b) labor. The former does not occur. Labor after ventrofixation of the vagina has not been seen, as only patients beyond the childbearing period were subjected to the operation. Labor complications may be prevented by sterilization or confining the procedure to women past the childbearing period. Fraenkel's operation has been performed many times during the last ten years without a single recurrence.

CHRISTIAN, S. L., and PALMER, L. A., New York. An apparent recovery from multiple sarcomata. *Mil. Surgeon*, July, 1927, lxi, 42.

The authors record what appears to be a remarkable case. A man aged thirty-one years

developed a myelosarcoma of the tibia near the site of a chronic osteomyelitis that had been operated upon twice and which, in turn, appears to have developed from a trauma. A few months after amputation of the thigh there appeared a subcutaneous metastasis above the umbilicus and recurrence in the femur and soft parts of the stump, which increased greatly in size. Both of these conditions progressed steadily during treatment by injections of Coley's fluid and metastatic growths appeared in many parts of the body including the right clavicle, the scalp and cranial bones. Under a further course of treatment by Coley's mixed toxins, increasing to 17 minims every day, there was progressive and complete disappearance of all the masses. The metastasis above the umbilicus, which had attained the size of a lemon, yielded to injections directly into it. Fifteen months after the amputation, the man was discharged in good health and apparently completely recovered, and he had gained about 40 pounds in weight. Sections from the tibia and from the supraumbilical metastasis were diagnosed myelosarcoma by Ewing Taylor, and the diagnosis was concurred in by James Ewing and Ernest Codman.

BIRD, CLARENCE E., Boston. Sarcoma complicating Paget's disease of the bone. Report of nine cases, five with pathologic verification. *Arch. Surg.*, June, 1927, xiv, 1187.

The incidence of sarcoma in Paget's disease, so far as it is represented among hospital patients in this country, is approximately one case in ten, a sufficiently high percentage to excite surprise in view of the age of these patients and the fact that bone sarcoma is considered to be a disease of youth.

In elderly people afflicted with sarcoma of bone roentgenograms of the entire skeleton should always be made, for it is probable that the coexistence of the osteitis deformans of Paget is frequently overlooked.

GILLIES, H. D. et al. Fractures of the malar-zygomatic compound: with a description of a new x-ray position. *Brit. J. Surg.*, April, 1927, xiv, No. 56, 651.

In fractures of the malar-zygomatic compound, the author suggests that a small incision be made in the temporal region, and a heavy blunt elevator be passed down along the fascial planes to beneath the region of the fracture.

By simple leverage, the fragments can in most instances be lifted into place without the necessity of making any unsightly, visible scar.

SIMPSON, WALTER M., Baltimore, and McINTOSH, A. ALEXANDER, Montreal. Actinomycosis of the vertebrae (actinomycotic Pott's disease). Report of four cases. *Arch. Surg.*, June, 1927, xiv, 1166.

Actinomycosis is a much more common disease in the United States than a study of the literature would lead one to believe. Actinomycosis of the bone is not so rare as is generally thought.

Four cases of actinomycosis of the vertebrae were encountered in the pathological laboratory of the University of Michigan. All came to autopsy with a clinical diagnosis of tuberculosis of the spine. Two of these occurred within the past year. In two the primary infection was in the lungs; in the other two, the primary focus was apparently in the appendiceal region. The spread of the actinomycotic process to the vertebrae was due to direct extension by means of dissecting sinus tracts and abscesses.

In actinomycosis of the spine, the characteristic lesion is cortical erosion of the vertebrae with vertebral phlegmon, while in tuberculosis the disease causes progressive destruction of the bodies, with collapse and angular deformity. Central destruction of the body of the vertebra, with ultimate collapse and deformity are not found in vertebral actinomycosis. The roentgenogram should easily distinguish the two conditions.

The many other causes of psoas abscesses should be considered before a diagnosis of tuberculosis is made. The development of multiple sinus tracts, with brawny induration of the surrounding tissues, and the persistent absence of the tubercle bacillus should direct one's thoughts to a consideration of actinomycosis.

The pathognomonic "ray fungi" should be

looked for by the surgeon who first drains an actinomycotic abscess. Subsequent secondary pyogenic infection renders the search more difficult.

Currettement of the granulation tissue wall of a sinus tract, with histopathologic examination of the fragments, will often establish the diagnosis after frequent examinations of the pus for actinomycetes have proved fruitless. The finding of lipoid cells in the granulation tissue lends support to the probability that the disease is actinomycosis.

Radical surgical excision of all involved tissue offers the best hope of cure, as demonstrated notably by Brickner.

CLEVELAND, MATHER, New York. Hallux valgus. Final results in two hundred operations. *Arch. Surg.*, June, 1927, xiv, 1125.

In this series the most satisfactory operation for correction of hallux valgus was resection of the metatarsal head, together with removal of the exostosis. In the selected cases with only moderate hallux valgus and in which the patients complained of painful exostosis and inflamed bursa as the chief source of annoyance, wide excision of the exostoses alone gave satisfactory results. Other operative procedures have not been found as satisfactory. The presence of chronic arthritis in the joint of the great toe predisposes to an unfavorable outcome in direct proportion to its degree of severity. An anterior arch that is severely impaired is a serious handicap in achieving a good result in the operative treatment of hallux valgus. Inadequate excision of the metatarsal and phalangeal exostoses leaves bony spicules which cause subsequent pain. Care should be taken to remove all loose fragments of bone or bone sand. The sesamoids beneath the metatarsal head should be examined as a cause of pain, and removed if necessary. Proper selection of the operative procedure to fit the individual case is of great importance.



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## CANCER\*

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### STATISTICS OF CANCER

**H**UMAN cancer is on the increase. Just what the absolute increase amounts to is difficult to determine. The figures advanced by the various authorities differ in so far as they have been compiled from different sources and angles of approach. The highest percentages of increase have been derived from the census mortalities; the lowest have usually been obtained from the clinical, biopsy, and post-mortem data.

J. W. Schereschewsky<sup>1</sup> in a study of a continuous twenty-year period, estimates this increase at 46 per cent, basing his figures on one of the most reliable sources of human mortality rates in the civilized world, namely the ten original registration areas of the United States. He covers the period from 1900 to 1920, in an area in which medicine has constantly been abreast of the times. During this period the population of this area rose from about 20 million to 27 million, representing one-fourth of the total population of the United States. This author's painstaking analysis of this subject deserves the most careful consideration.

Using the statistics of the decennial census reports, and the many other facilities furnished by the Census Bureau, Schereschewsky computes the cancer rates by age groups and by organ and system incidence, using, so far as possible, the inter-

national classification. His results follow:

The decrease in the population of individuals above forty averaged one per cent less per decade of life at the end of this period. This is the commonest span of life for the development of this scourge, and the fewer individuals reaching it toward the end of the period covered, as shown by this decrease in the upper age groups, would tend to produce a false decrease in the total percentage increase of cancer.

What does this mean? In all probability it indicates that the mechanisms of infant welfare, and of preventive medicine, have been so effective against tuberculosis, typhoid fever and other diseases of young adult life, that more individuals susceptible to disease of later life because of somatic defects attain the cancer age, only to succumb all the more easily to cancer, to vascular, renal and the other diseases of later life, and so fail to attain to higher age groups.

Although this smaller percentage of survivors to the cancer age exerts a false decrease in the cancer rate, the real effect of the latter is to produce a paradoxical increase in the incidence of cancer. Individuals formerly doomed to die before forty from certain inherent defects of development, circulation and nutrition, are now numbered in the ordinary increase of the population. From the standpoint of health, and particularly with reference to cancer and the preventable diseases of

\* Submitted for publication April 2, 1927. This is the first of a series of articles on cancer by Major Coupal. The next will appear in an early number.

middle life, they present a momentous problem. If we presume that 10 per cent of the population increase for 1920 was due, not to the added number of births, but to the decrease in infantile and young adult mortality, evidenced by the drop in the rate of these preventable diseases, then 10 per cent of the 7 million increase, or considerably over 700,000 of the 27 million living in 1920 in the area studied, came of that defective type of germ plasm which in the view of many authorities is prone to develop cancer. What influence this 10 per cent increase of tissue defectives has on the total increase of 46 per cent in the cancer incidence can only be surmised.

Schereschewsky makes a very logical analysis of these statistics to ascertain the percentage of increase due to greater accuracy of diagnosis in reports of causes of death, as given in the mortality rate. His conclusion that this new coefficient could account for only 10 per cent of the increase is fairly well grounded and would be most difficult to refute. He points out that this increase is maintained for those cancers of accessible sites (buccal cavity, breast, skin etc.) in which there is a negligible factor of error, and that the decrease of deaths due to ill-defined causes and senility only adds about 10 per cent to the cancer rate, and is, for the most part, transferred to the cardiac and renal groups of diseases. This claim seems fairly well justified if we note that the increase of cancer of accessible sites amounts to 103 per cent, while the total increase is less than one-half this figure.

It could further be claimed with justice, that the 148 per cent increase in the inaccessible sites (peritoneum, intestines, rectum) alone would be more than sufficient to account for the 10 per cent due to better diagnosis (advances made in roentgen ray) of cancer in these inaccessible areas, during this particular period.

In the same period the death-rate from non-malignant tumors has fallen 50 per cent, and the bulk of this must have been

transferred to the cancer rate; but the total number was so small as to influence the total percentage very slightly. It must be remembered also, that improvement in the diagnosis of cancer must have been greater in the earlier than in the later stages of the disease, and because of this, its consequent greater number of surgical and other types of cures in this condition, the mortality statistics, as studied by certain groups, would fail to show those so cured. This would tend to make figures which do not include cured cases show, according to the percentages of cures reported from various clinics, approximately a 15 to 20 per cent higher incidence than reported in the mortality rates. From clinical sources, the increase of cure in accessible cancers runs as high as 40 per cent in some sites, yet the increase of the death rate from buccal cancer is 103 per cent, indicating that this figure is much below actuality. When we compare this figure with the rate in the inaccessible portions of the intestinal tract (the greatest increase of all—amounting to 148 per cent), we can infer that the bulk of this increase is due to better diagnosis and to higher rates of post-mortem verification. The failure of cure in these areas, as compared with that in accessible sites, might also be claimed to be even greater than the difference in the mortality percentage increases of 103 and 148.

After indicating that all of his figures were taken from mortality statistics, Schereschewsky concludes that cancer has an apparent increase of 46 per cent during 1900 to 1920, of which approximately 30 per cent represents an actual increase.

Hoffman,<sup>2</sup> using as data the death-rate in twenty-three American cities with a population of over 20 millions (1925) reports an increase of 50 per cent in deaths from cancer. He claims that this increase is real and not apparent, and that the incidence is far in excess of the death-rate. The origin of these figures is probably more accurate than those of Schereschewsky, since Hoffman indicates that they



were collected from reports of large cities where roentgen ray, pathological histology and other diagnostic facilities would be more easily available than in state areas as a whole. This author views the situation as alarming, and states that preventive measures run far behind the increase. He notes that sarcoma makes up 4.8 per cent of malignant tumors. He also quotes figures from the Metropolitan Life Insurance Company, which, during 1911 to 1922 (the latter half of the period studied by Schereschewsky) show a decline in the mortality of buccal cancer of 7 per cent. This decline, in the face of an increase of 103 per cent in the figures of Schereschewsky indicates that the measures against accessible cancer were catching up in the mortality to the present reported clinical figures. The comparison with the other accessible sites of cancer shows a corresponding decrease in mortality rates, with the exception of breast cancer, which has for this period maintained its death-rate practically on a level with the cancer of inaccessible areas. This would seem to indicate that, of the accessible cancers, that of the breast alone is failing to decrease its toll, in spite of the measures of surgery, roentgen ray, radium, and the so-called "radium knife." Those who are familiar with the histopathology of the glands of the axilla, in cancer of the breast, and the story of their very early involvement microscopically, long before there are any palpable or macroscopic evidences of this condition, readily realize why this is so. From the increased use of frozen section in the operating room in the last five years, and the increased measures being brought to bear against the recurrence in the lymphatics of breast tumors, it is reasonable to expect a decline in the mortality of tumors of this organ, and that in the statistics of the coming five years this decline will begin to approach the drop that has occurred in the cancers of other accessible sites. This would represent the usual ten-year lag between the mortality rate, and the curve of the clinical

cures, which has already appeared in the other approachable sites of cancer.

The thirteenth annual report of the Harvard Cancer Commission<sup>3</sup> shows a percentage of 13.3 of benign tumors, among the patients who have applied to this clinic, which compares with the rate of 12 per cent observed in the United States Public Health reports for 1900. The latter rate dropped to 7.9 per cent in 1920, and Schereschewsky claims that it was due to the correction of wrong non-malignant diagnoses, which obviously belonged in the malignant column of the mortality rate. The above high rate is easily explained when we consider that the figures are taken from clinical records in an area, and at a time, when a vigorous campaign against cancer is being waged, and where the clinic is called a "Tumor Clinic" in an attempt to avoid the lay stigma attached to the term "cancer," in order to get the operable new growths to the surgeon early enough for the highest possible percentage of cures. This use of the term "Tumor Clinic" has a double value, in that it avoids the horror of the idea of cancer that exists in the lay mind, and so brings patients to the aids for this condition sooner, and also takes advantage of the mechanics of the theory that is so rapidly gaining ground, that there is a possibility of transition to malignancy in benign tumors. These figures are notably reliable, since this clinic follows very closely the histology of all its tumors.

In an article in which he takes the stand that practically all the increase in the incidence of cancer is only an apparent one, M. Ménétrier,<sup>4</sup> taking his figures from autopsies, shows that Bayle<sup>5</sup> in 1816 found 100 deaths from cancer of the stomach in 2556 autopsy reports in individuals aged fifteen years and upwards. He cites these figures, and the proportion in which they appear in the different parts of the stomach, as identical with the incidence of cancer of today, where the figures are taken from the same reliable sources. Ménétrier makes no allowance for the

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errors in diagnosis of these early times, which probably augmented the figures by diagnosing some of the chronic inflammations as new growths nor does he charge off from his hospital records of entries the surgical and other cures that must be admitted today.

Taking the records of 7006 autopsies, from the Pathological Institute at Lwów in Poland performed in the period from 1896 to 1903 W. Janusz<sup>6</sup> found 366 cancers, or 5.27 per cent. From 1904 to 1920 in 13,976 autopsies, he found 831 cancers, or 5.95 per cent. In 1922 the percentage rose to 6.6, and to 8.3 in 1924. Both of these two latter authors show a relatively small increase in this condition, as do most of the investigators who take their data from autopsy records.

Analyzing the statistics at a Marseilles hospital L. Imbert<sup>7</sup> reports 11 cases of cancer in 1000 entries in the period from 1871-75, which rose to 40 cases per 1000 in 1920 to 1924. He finds that this condition in accessible sites is decreasing, while it is increasing in the inaccessible areas. He feels that the bulk of this increase is due to better diagnosis, and an appreciable increase in the mean duration of life. The difference in these different areas of the body may be influenced by two factors, the increase of the cures in the accessible, and the improvement of diagnosis of cancer in the inaccessible sites.

## SUMMARY OF STATISTICS

It is usual for those authorities who collect their data from autopsies, to set their figures of the increase of this condition much below those who take it from mortality statistics. The clinical groups place the increase about twice as high as the highest presented by the groups obtaining their figures from large series of autopsies, which is a logical result when we consider the proven results of cures, with the modern measures we have at hand, to combat this condition. In spite of this, and the similar excess their figures should show for the same reason over the mor-

tality from cancer, the clinical groups almost without exception grade their estimate of the increase far below that of the pure statisticians, usually computing it at about one-half of the latter's figures.

Until these several groups pool their interest in cancer statistics and a combined paper is prepared, with data taken from all three sources, and compiled in unison, the true figures for the actual increase of human cancer will not appear. This paper would best be prepared at some large clinic where a high percentage of autopsies has been obtained, over a period of several decades, by three co-authors, a statistician, a clinician and a pathologist. The statistician and the pathologist should be writers with mature judgment, and the clinician, a surgeon at the head of a large cancer clinic. The latter should be in close contact with radium and roentgen-ray specialties.

A paper of this sort would correlate our existing knowledge to date, point out in what organs our measures against this condition are failing and probably reveal facts of the highest value to all concerned. Until this paper is written, only the logics of comparison can help us to evaluate the discrepancies of these figures. A conservative estimate from a process of this type suggests that the mortality statistics which when averaged, show an increase of 50 per cent in the deaths from cancer in the last three decades, should be interpreted as follows: Thirty per cent is due to better diagnosis and greater accuracy in reporting causes of deaths. Ten per cent represents an actual increase in the incidence, due to the greater number of individuals, with no greater susceptibility to this condition than the persons who reached the cancer age twenty years ago, and who now attain it to swell the numbers that succumb to this dread incubus. The remaining 10 per cent, another real increase of incidence, is probably due to a larger number of individuals reaching the later decades of life, with those somatic defects of tissues and organs which are

thought to raise their chances of having cancer.

While this apparent and real increase has been going on, there has been a remarkable advance in the surgical, roentgen-ray, and radium measures for the cure of this condition, and because of the same improvement of diagnosis which has so augmented the death-rates, these measures have been applied to cancers in much earlier stages than ever before. The result is that conservative clinicians claim that 30 per cent of cancer is being cured. What does this mean? This 30 per cent of cures is obviously missed in a study based on mortality rates. On the other hand, this percentage is computed for the most part on the so-called operable cases, and for this reason represents only about 50 per cent of the totally observed clinical incidence of this dreaded scourge.

#### CONCLUSIONS

Therefore one-half of this 30 per cent of cures or 15 per cent, must be added to the mortality rates, making an actual net increase of 35 per cent, which probably represents the actual increase of the menace of cancer to the human race, not explainable in any way except possibly in the changing human habits brought about by modern civilization, since this increase is not observed in virgin races. This is further borne out in the fact that amongst these virgin races sarcoma makes up one-half of the incidence of new growth while in civilized peoples it has fallen behind cancer to the extent that it only occurs once in ten malignancies.

#### THEORIES OF CANCER

James Ewing<sup>8</sup> defines tumor as "an autonomous new growth of tissue," and goes on to a description of the etiological influence the various causative factors have upon the production of tumors. The factor of heredity he justly confines to the gliomas, which, though they definitely follow some of the hereditary laws, are the most atypical of tumors, answering

but few of the general laws of new growths. He then goes into the theory of trauma as a cause of tumors, with a single large trauma as the cause of sarcoma, and the long-continued low-grade traumata as the causes of pipe cancers and the cancers of paraffin and roentgen-ray workers, chimney sweepers, betel nut chewers, of the carriers of Kangri baskets, and of those who handle tar. He also mentions the appearance of cancer in the thyroid of fishes as the result of exaggerated response to physiological stimuli, and the origin of tumors in the regions undergoing repair following tuberculosis, syphilis and the other chronic infectious diseases. Ewing passes over very lightly the possibility of cancer regions, houses and families, and does not seem to put any credence in the other geographical or meteorological reasons assigned by countless authors as causes of this condition. In a like manner he indicates that the various parasites that have been accused of causing cancer, act as do the chronic infectious diseases by producing that condition of over-repair which acts as the finer traumata and irritations that are followed by tumor.

Although the parasitic theory has had many adherents, and numerous gross and microscopic organisms have been seemingly convicted of producing cancer, the very multiplicity of this list is excellent evidence that they will all join that great parade of specters of the past that have been so accused. The latest and most attractive of these theories as reported by Gye and Barnard<sup>9</sup> described cancer as caused by a filterable virus which consists of two separable elements: one, a non-specific virus which is thrown down by the centrifuge, is thermo-labile, and is destroyed by chloroform and other chemicals destructive to life; the other a specific thermo-stable chemical substance, resistant to these chemicals, which determines the cellular character of the transplanted tumor. In the first paper the authors suggest that irritation may by some chemical or physiological action furnish the specific factor

which allows the virus to infect, and, in this manner explain why an infecting agent can show in many tissues the peculiar cellular reaction that each tissue shows to new growth. These authors have photographed with ultraviolet light certain spherical bodies which they claim to be the specific virus. In a second paper of greater detail and furnished with charts that show the inhibiting influence of various antiseptics on this two-factor virus, Gye defends his theory against the many criticisms of authors who have endeavored to repeat his work. J. B. Murphy,<sup>10</sup> of the Rockefeller Institute, after attempting to parallel this work, concludes that the power to activate a chloroformed filtrate is not proof of a living organism, since he found that tissue cultures of embryonic cells and of placenta are as powerful in this respect as are the so-called cultures of malignant tumors. This author feels that the causative agent of the chicken sarcoma of Rous may be an enzyme-like substance which can be inactivated by chloroform and similar chemicals, and in turn reactivated by a diffusible extract of new growths, embryonic or placental tissue, or that the chemical treatment so attenuates this substance that it is only revived by the extracts from the "cultures." Anaerobic cultures of chick embryo and rat placenta are just as effective as the so-called cultures of Gye in activating the chloroform-treated filtrates of chicken sarcoma.

In a résumé of the cytology of cancer R. J. Ludford<sup>11</sup> discusses the etiology of this condition from the present state of the knowledge at hand of this subject, and compares the culture of tissues to the cellular activity of tumors. In both, the growth is continuous as long as the medium is satisfactory and the supply of nutrition is maintained at the proper level, and in the cultures if the sub-culturing is adequately carried on. He disclaims any specific cytological attributes peculiar to cancer, other than those that are found in any rapidly growing tissue, except those

produced by the inability of the stroma to handle the problem of nutrition.

Ludford weighs many of the theories of new growth and discards those that are found wanting, either for lack of proof, or their failure to apply to all types of this condition. The embryonic rest theory of Cohnheim infers that certain cells fail to continue to divide at the same rate as their neighbors during the rapid cell division which occurs in early fetal life. These cells in adult life for some unknown reason suddenly take on the rapid cell division characteristic of the fetal span of existence, and result in cancer. This theory answers very well for teratomas and embryomas, but as will be shown later, unless combined with other theories, it does not apply well to the commoner and much more numerous new growths. The many cytological theories are discussed by Ludford and excellent reasons are given for discarding them. The gametic theory infers that the heterotypic mitotic form of cell division that occurs in germ cells is taken on by tumor cells which by this means throw off the somatic control of the body, multiply at its expense without contributing any function to its common welfare and live on it purely as parasites. This same autonomous urge in the gametes of the lower animals enables them to live in the fluids of the parent and in the higher animals allows them to develop the placenta which has the ability to invade tissues and to assume practically malignant tendencies in its search for nourishment from the tissues of the parent. This theory is discarded by Ludford for the lack of proof that this type of mitosis exists in new growths.

The chromosome theory of Boveri holds that malignancy results from an initial abnormal cell division, one of the daughter cells of which has a chromatin content which enables it to exist independently of the somatic factors that control cellular growth. These attributes allow the resulting group of cells to assume the autonomous character described by Ewing, and

the parasitic rôle of existence exhibited by all tumors. Ludford's article contains an excellent histological, physiological and mechanical description of a cell, which includes all of the accepted knowledge of this subject to date and affords an elaborate working plan of this structure, of inestimable service in the consideration of any theory of cancer. The extent of malignancy is measured by the amount of variation from normal function shown in the internal structure of cells as well as in their arrangement to simulate the normal form of organ or tissue complex as expressed in the region from which they arise. The greatest variation of cellular structure is found in the Golgi apparatus; yet this change does not entail any wide variation from that of the cells of the normal tissues from which the tumor arises, so that such a change cannot be labeled as characteristic of cancer. The variation is a quantitative rather than a qualitative one. The variations of the polarity of cells is the factor that makes tumor tissue seem to differ so markedly from normal, and is only consequent on the degeneration of the function of the cells which the particular new growth happens to show. The amount of stroma governs directly the polarity of functioning cells, determines the distribution of their mitochondria and the amount of variation they show from the normal. The hypertrophy of the stroma which accompanies new growth and makes the nuclei of this tissue larger and more conspicuous and the cytoplasm and its products grosser and more easily discernible is undoubtedly caused by the same growth-promoting urge that is responsible for the malignancy of the so-called parenchyma of the tumor. This is probably augmented by the autolysins from the necrotic portions of the tumor. The abnormal appearance of the chromatin of tumor cells, the process of the formation of inclusion bodies and the production of nuclear fragmentation are all ascribed by the author to functional or pathological expressions of rapid cell division.

Ludford also refers to the theory of Brailsford Robertson, which proposes that asymmetrical mitoses are factors in cancer, because of the possibility that the daughter cell with its larger nucleus and smaller amount of cytoplasm has a consequent greater portion of its energy and nutrition directed toward reproduction and away from function, thus enabling its progeny to overcome the tissue tension and growth restraint of its neighbors and to become cancerous. Giant cells are thought to be the result of various defects of mitosis due to faults of nutrition and of those growth-inhibiting substances in rapidly growing tissues that necessitate sub-culturing in the *in vitro* experiments of normal and cancer tissue cultures.

In an excellent article on the experimental production of new growths with oils, Burrows and Johnston<sup>12</sup> claim that the factors of function and of growth are balanced in normal adult tissues, and that new growth is due to a loss of this balance. The rapid growth of an embryo is maintained by the high quality of the nourishment furnished through the placenta, and continues until the new individual is brought to the stage where it begins to function, and has to elaborate its nutrition from foods of a more highly organized character. As this transition takes place the tissue energy is turned from growth and reproduction to function, and only so much of the former remains as is necessary to the automatic replacement and repair needed to combat disease and take care of the wear and tear incidental to normal function. Then any abnormal call for repair or replacement that is continued and repeated, as is the case in chronic inflammation, or any fundamental change in the character of the nutrition of a part or organ, may divert the energies of a tissue from function to growth, and if the factors that govern this change have any of the elements that make for a vicious circle, embryonic speed of growth occurs, and cancer may result. Burrows and

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Johnston claim that tissue cultures elaborate a substance which stimulates cell division, that small quantities of this substance cause the cells to digest fats and proteins, that larger ones promote reproduction and that still larger quantities produce autolysis.

## SUMMARY OF ETIOLOGY

A summary of these facts about cancer and the theories that seem to be justified by them might be enumerated as follows:

Ewing's definition of cancer, "an autonomous newgrowth of tissue," might be interpreted to mean that a tumor represents a local rebellion in a tissue or an organ, a declaration of independence on the part of a group of cells, with an attempt to throw off the yoke of service to the body as a whole.

This results in a mass of cells, in or on a tissue or organ, which attempts to refuse to function, and to divert all the local nourishment to the establishment of a separate entity. This idea of a separate entity is well expressed in the teratomas, and reaches its extreme form in the true parasitic monsters. At the other end of this scale of pathological events is the normal degree of the usual process of repair in tissue. The events in between are so varied, that the logics applied to the cause of cancer have resulted in an almost infinite list of the theories of its etiology. The cause and effect mechanics of the process of repair are most intricate. The first to be considered is infection, which when it is acute, results most often in a normal repair process that fills the resulting defect to the limit of its ability. In many instances this may be complete, and an excellent example is seen in lobar pneumonia, where even though the portion of the lung affected may seem to be a frank collection of pus, apparently obliterating the alveolar walls, the area becomes organized, and no scarring or other remnants of repair remain behind; the texture of the lung appearing as before. From this apparent complete repair at one end of the scale, there is every degree of incomplete repair, even in the wake of the acute infectious diseases, that afford the opportunity of over-repair

that is included in the term chronic inflammation.

This condition includes the arches of young blood vessels that are always present in an organizing area, which may completely disappear, at the lower end of the scale, and those overgrowths of young connective tissue, which are difficult to differentiate even under the microscope from the slower growing sarcomas, on the other end. These arches of young blood vessels are a most important factor in the physiological consideration of the etiology of new growth. They furnish two of the factors dwelt upon by Burrows and Johnston<sup>12</sup> in their consideration of the cause of cancer, so well supported by their work on tissue and cancer transplants, and so richly elaborated by the work of countless other research workers. One is the additional nutrition apparently fitted for the growth as opposed to the function of tissues, and the other is the presence of young connective tissue ideal for cancer stroma, and the embryonic attempts on the part of gland or other parenchymal structures, to replace such functioning areas as have been lost. Add to this the usual tardiness of nerves in the process of repair, with the loss of their trophic and sympathetic inhibitions, so necessary in the balancing of function against repair and replacement, and we have the ideal situation for a form of tissue insanity, in which normal function with its moderate demands for nutrition is unseated, and an embryonic speed of growth results. This rapid growth is ordinarily confined to a very small per cent of the tissue activity, and only operates sufficiently to take care of repair and replacement, made necessary by the ordinary wear and tear in a tissue or organ. When automatic repair and replacement usurp the place of function in a tissue and run riot, with a speed of growth only seen in the embryonic span of life, these cells secede from the economy of the tissue or organ and become cancer.

The physical or cellular elements that underly the etiology of cancer are well illustrated in the various phenomena that occur in chronic inflammation. In addition the rôle that fat, and fat soluble substances, play in the production of experi-

mental cancer, also indicates that the fatty degeneration occurring in many processes of repair may also have a chemical influence comparable to the use of paraffin and other oils in the production of cancer.

## REFERENCES

1. SCHERESCHEWSKY, J. W. Cancer mortality in ten original registration states. *U. S. Pub. Health Rep.*, Jan. 1, 1926, xli, 1-12.
2. HOFFMAN, F. L. The increasing menace of cancer. *Illinois Med. J.*, Sept., 1926, l, 221-229.
3. Harvard Cancer Comm., 13th Annual Report of the Huntington Mem. Hosp., 1925.
4. MENÉTRIER, M. La question du cancer. *La Tribune Médicale*, May, 1926, No. 5.
5. BAYLE, G-L. *Traité des Maladies Cancéreuses*. Paris, 1839.
6. JANUSZ, W. Krebsstatistik Inst. d. Univ. zu Lwow. *Ztschr. f. Krebsforsch.*, 1926, xxiii, 47-65.
7. IMBERT, L. L'augmentation de fréquence du cancer. . . . *Bull. de l'Assoc. franç. p. l'Étude du Cancer*, 1926, xv, 141-148.
8. EWING, JAMES. *Neoplastic Diseases*. W. B. Saunders, Phila. and London, 1922, Ed. 2.
9. GYE, W. E. Etiology of malignant new growths. *Lancet*, July 18, 1925, ii, 109-117.  
The cancer problem. *Brit. Med. J.*, 1926, ii, 865.
- BARNARD, J. E. Microscopical examination of filterable viruses, associated with malignant new growths. *Lancet*, July 18, 1925, ii, 117-123.
10. MURPHY, J. B. Etiology of tumors evidenced by experiments with chicken fever. *J. Am. M. Ass.*, April, 1926, lxxxvi, 1270-1271.
11. LUDFORD, R. J. *J. Roy. Microscop. Soc.*, Sept., 1925.
12. BURROWS, M. T., and JOHNSTON, C. G. Action of oils in production of tumors with definition of cancer. *Arch. Int. Med.*, 1925, xxxvi, 293-332.





# A CONTRIBUTION TO THE DISCUSSION OF PAGET'S DISEASE OF THE NIPPLE AND GYE'S HYPOTHESIS

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THE text of this discussion is taken from Figure 1, a photograph of a whole breast slide from tissue sent by Dr. W. L. Lathrop and Dr. R. A. Gaughan of Hazelton, Pa. The case history follows:

Mrs. F. H., 60, married, three children, youngest 26, no miscarriages, had a "lump" in

It is important to note that according to the hospital history the patient considered that she had a lump in the breast for twenty years, the nipple had been ulcerated six months, the entire breast was hard but no separate mass was felt, and there were no chest signs while the patient was in the hospital. The fatal

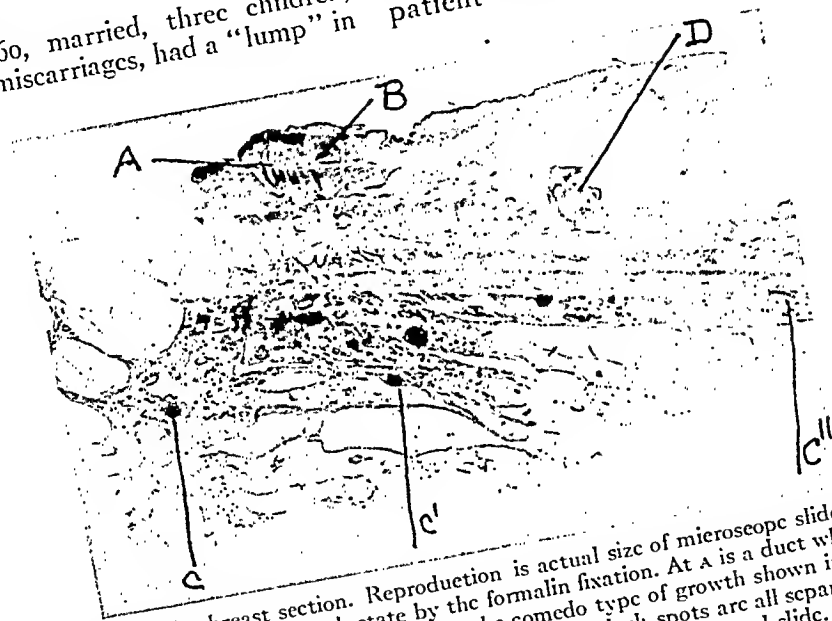


FIG. 1. Photograph of entire breast section. Reproduction is actual size of microscope slide. The tissue is somewhat shrunken from the size in the fresh state by the formalin fixation. At A is a duct which can be traced for about 7 mm. This duct is shown in Figure 3. At B is the comedo type of growth shown in Fig. 4; C, C' and C'' indicate three of the separate scirrhus nodules. Similar small dark spots are all separate scirrhus nodules. Over twenty can be counted in this slide. Point C is 8 cm. from C'' in the actual slide. One of these scirrhus nodules is shown in Figure 5. At D is the nodule showing a marked glandular type. This is shown in Figure 6.

the breast for twenty years, and ulcerated nipple for six months. Rapid growth during this latter time. Admitted to State Hospital, Hazelton, November, 1926. The nipple has disappeared and is represented by an ulcerated area typical of Paget's Disease. The entire breast is hard but no distinct nodules can be felt. There are nodules in the axilla. November 18, 1926, radical operation. Died at home January, 1927 of acute pneumonia beginning with a chill. Glands in axilla show invasion under microscope.

pneumonia about two months later seems to have been acute.

Examination of the entire photograph (Fig. 1) shows:

- (1) A thickening of the epithelium of the nipple about  $1\frac{1}{2}$  cm. in diameter. Under the microscope this is a typical squamous epithelioma showing all the characteristics frequently described (Fig. 2).
- (2) In the dense subcutaneous tissue of the nipple several dilated ducts can be

seen in all of which there is an overgrowth of epithelium quite similar to the typical squamous-celled epithelioma on the surface. This extension of the malignant epithelium down the ducts has also often been described. Figure 3 is a low power photomicrograph of a duct at A in Figure 1. The opening of this duct on the surface is seen and the duct can be followed down in the section for about 7 mm.

(3) In the dense connective tissue of the nipple are several places where the

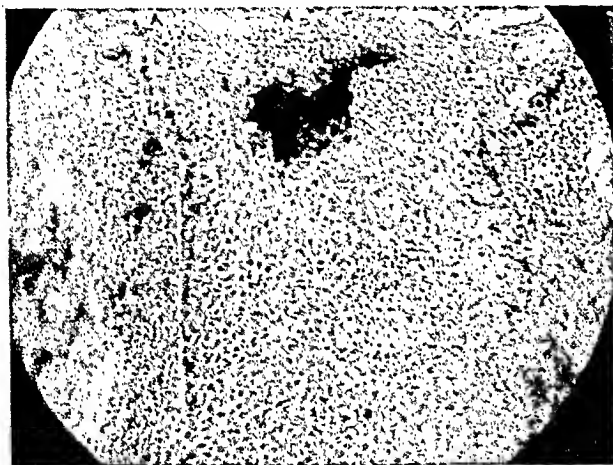


FIG. 2. Surface of the nipple showing squamous-celled epithelioma. The line AAA is the actual surface.

malignant process is of the comedo type (Fig. 4).

(4) Beginning about 1½ cm. under the nipple surface there are several dilated ducts the epithelium of which shows only a slight degree of ordinary proliferation.

(5) Scattered throughout the entire breast tissue there are scores of separate and apparently independent nodules of typical breast carcinoma of the scirrhus type.\* The smallest ones are visible only under low power. The larger ones (4 to 5 mm. in diameter) are easily seen in Figure 1 in their actual size. Many sections have been made at different levels of the breast and these minute scirrhus growths are quite the same in all. The most distant

\* The word scirrhus, which is being discarded by some pathologists, is retained in this article not as indicating a separate variety of carcinoma but as a descriptive word best expressing the well known architectural arrangement between epithelium and connective tissue.

ones are about 8 cm. apart in the formalin-shrunk tissue (Fig. 5).

(6) About 2½ cm. to the right of the nipple at the junction of breast tissue and subcutaneous fat there is a larger nodule (about 5 mm. × 8 mm.) which even the naked eye can see is different from the scirrhus nodules. Under the microscope this is a glandular type of growth, definitely carcinoma and resembling the so-called sweat gland type of Ewing (Fig. 5).

To sum up, there are in the same breast



FIG. 3. Low magnification of the duct at A, Figure 1. Showing the very much thickened epithelial lining traced into the deeper part for 7 mm. This thickened epithelium is undoubtedly malignant and part of the squamous epithelial growth seen at the surface. The point E in this figure is shown in higher power in Figure 2.

four different types of carcinoma: (1) squamous epithelioma, (2) comedo type, (3) scores of separate scirrhus growths, and (4) a sweat gland type.

Three master surgeon-pathologists, Sir Lenthal Cheate and Mr. Handley in London, and Dr. Bloodgood in Baltimore have recently made valuable contributions to the literature. All of these writers have convincingly demonstrated their own points of view. Confusion still exists, however, because, including other writers "Paget's disease" has been used as a blanket term to cover any condition in the nipple, from those which can be cured by a little soap and water to those which are not cured by extensive operations.

It would seem that Handley<sup>1</sup> has shown

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conclusively what should be considered as the condition described by Paget and consequently the only one which should go by Paget's name. According to Handley the change in the nipple in Paget's disease proper is in no way a neoplastic but rather an atrophic process caused by interference with lymphatic circulation due to the infiltration of carcinoma cells under the papillae of the nipple and areola from an underlying breast cancer which may have been dormant for a long time and produce

Cheatle has definitely proven an important fact in connection with squamous epithelioma, that is, that it is frequently associated with carcinoma of other types deeper in the breast. This association of deep carcinoma with both squamous epithelioma and true Paget's disease is another factor that has confused the two diseases. Cheatle also shows that in squamous epithelioma the carcinomatous process extends deeply from the surface and involves the duct epithelium for considerable distances (see

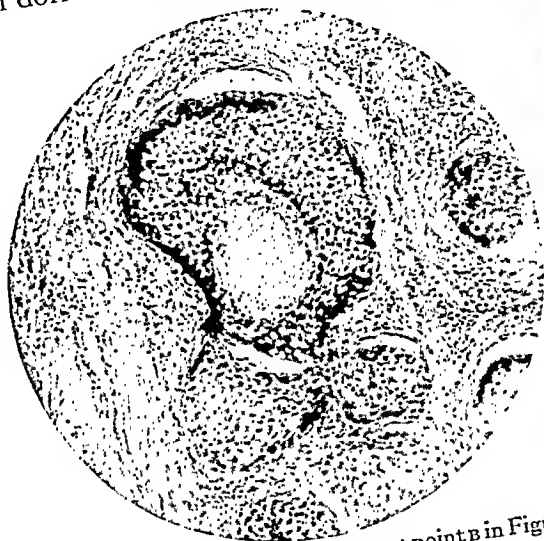


FIG. 4. Comedo type of growth seen at point B in Figure 1.

its first outward manifestation in the nipple in this way. This is why Paget discovered clinical carcinoma in the breasts later. Handley's illustrations definitely establish this condition as a clinical entity and the logical one to call Paget's disease. Very obviously, as Handley emphasizes, this condition has nothing to do with squamous-celled epithelioma of the nipple. If this distinction will hold, the present confusion will cease.

Sir Lenthal Cheatle<sup>2</sup> has two very scholarly papers under the title of Paget's disease. It would seem to me, however, that the conditions he illustrates are frankly squamous epithelioma and if accepted on this basis Cheatle's work goes far to solidify our knowledge of the latter condition and also helps to distinguish what Handley terms true Paget's disease.

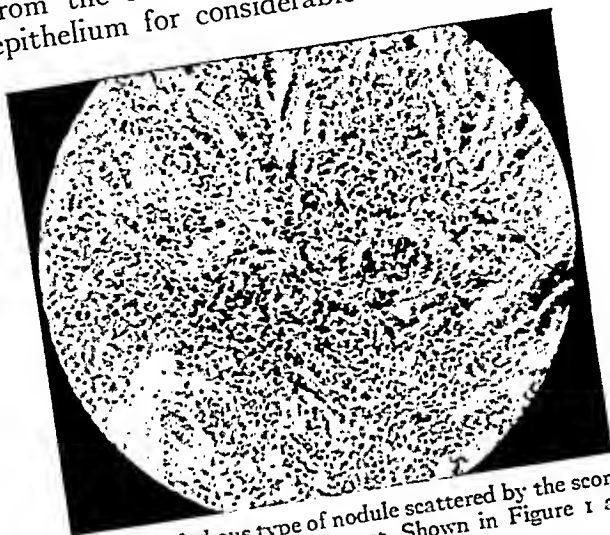


FIG. 5. A scirrhous type of nodule scattered by the score throughout the entire breast. Shown in Figure 1 at c, c' and c'' etc.

Fig. 2). Cheatle, at least in 1924, seems inclined to believe that it is this downward spread through the ducts that produces deeper true breast carcinoma later. This point will be considered below.

Bloodgood<sup>3</sup> has rendered great service by calling attention to the fact that the nipple, like any other portion of the body, may be the seat of eczema, dirt irritation, and other conditions that yield readily to soap and vaseline or silver foil protection and should not be dignified with the name Paget's disease or squamous epithelioma or any name suggesting the need of surgery. It is, of course, very important that these benign, easily curable lesions should be included in any discussion of nipple diseases but it should be emphasized that they are to be definitely distinguished from Paget's disease and also from squa-

mous epithelioma. (Basal celled epithelioma of the nipple occurs very rarely.)

Bloodgood has also noticed the spread of the carcinomatous process down the ducts and the presence of carcinoma deep in the breast tissue. He does not discuss the connection between the two except to say that he considers the nipple carcinoma to be the primary one. Kilgore,<sup>4</sup> after a study of Bloodgood's sections, is also of this opinion. Bloodgood states that in squamous epithelioma of the nipple he has seen axillary involvement without involvement of the breast tissue. With the ordinary small slides evidence on this point must be considered as negative evidence. When more sections of the whole breast are studied this situation, like many others, may change.

As noted above Cheatle, Bloodgood, and others have seen both squamous-celled epithelioma of the nipple and deep breast carcinoma at the time of observation and there has been a long discussion as to which is primary and which secondary. It recalls the argument concerning the hen and the egg and the disputants are still as far apart as ever in both cases. I do not recall that anyone has ventured the opinion that neither is secondary to the other but that both arise independently at or about the same time from a cause or causes that have equally affected both places.

The very unusual specimen shown here seems to throw considerable light on the relation between the superficial and deep carcinomata and also on the question of multicentric carcinoma in general.

To recapitulate, there are in this section: First, scores of apparently independent foci of scirrhus carcinoma all apparently of the same age and stage of development and each one apparently independent of the others. Second, one glandular type nodule. Third, definite comedo types. Fourth, squamous epithelioma. The more this slide is studied the more it seems that the nodules could not have been spread by lymphatics from an original focus. Cer-

tainly, such an original focus would be larger, more advanced and plainly evident. Also if it were spread by lymphatics the type of growth would be essentially the same all over. Four different types would not be caused in this way. Again, if we eliminate the glandular nodule and the comedos in this slide as accidental and at all events unexplainable, there is still a squamous-celled epithelioma of the surface and a scirrhus growth in the breast. This is the condition, as already noted,

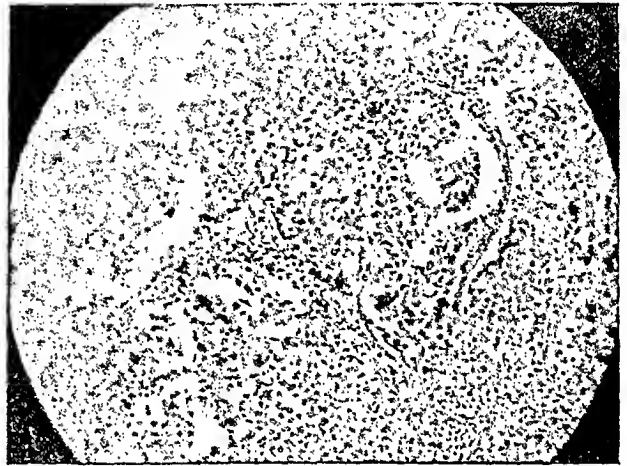


FIG. 6. The glandular type of growth shown at D, Figure 1.

which has been described by Cheatle, Bloodgood, and others. This is the condition that has caused so much discussion as to which neoplasm is primary and which causes the other. So far as I know the discussion has been only as to which is primary. All writers agree that it is simply a matter of spreading from one to the other, that the squamous epithelioma spreads down to the breast and there starts a scirrhus; or, vice versa, the scirrhus spreads to the nipple and there the picture becomes that of squamous epithelioma. From what we know of the specificity of any growth it is very hard to understand how this change can take place. In other places when a scirrhus growth spreads it retains its essentially scirrhus character. If it reaches the liver it is still scirrhus, changed a little perhaps by mechanical environment but scirrhus nevertheless. If a

squamous epithelioma spreads to bone it retains its own character, it never starts a bone cancer. So it may seem that for a squamous epithelioma to spread into the breast and there appear as a scirrhus, or vice versa, is quite at variance with all that we know about the spread of neoplasms. Therefore, direct spread of carcinoma by lymphatics seems entirely inadequate to explain the condition in Figure 1.

It would seem that the only hypothesis that can explain the findings in Figure 1 is Gye's. That is, it would seem that there had been some change in this breast which produced Gye's specific substance in many cells all through the organ. Then the infecting agent was introduced in some way and independently scores of scirrhus nodules started all through the breast tissue; in at least one spot a different type of cell was involved and it developed its own type of glandular carcinoma. Another type of cell was driven into malignancy and had to produce the comedo type. The surface cells, also driven into malignancy, produced their own type, the squamous epithelioma. Figure 1 is a fact, not a theory, and it is maintained that it can be explained by Gye's hypothesis only. What Cramer<sup>5</sup> has said of Gye's hypothesis in another connection applies directly here, that "It does not conflict with any previously established facts. It confirms them. . . . It removes all apparent contradictions. It explains all the essential features of the disease."

## SUMMARY

1. The nipple, like any other portion of the body, is subject to non-malignant diseases.
2. Paget's disease is a distinct entity due to disturbance of nutrition from permeation of cancer underneath. The deep cancer may not be clinically evident till some time later. It is not a neoplasm of the nipple. Especially, it is not squamous-celled epithelioma.
3. Squamous-celled epithelioma of the nipple is often if not, in time, always, associated with carcinoma of deeper portions of the breast.
4. This association is not adequately explained by spread either direct or by the lymphatics. It is adequately explained by Gye's hypothesis.
5. Figure 1 represents a condition that can be explained by Gye's hypothesis only. The author is indebted to Mr. W. I. O'Neill of Columbia University for the photomicrographs.

## REFERENCES

1. HANDLEY, W. S. Cancer of the breast and its treatment. N. Y., Paul B. Hoeber, Inc., 1922.
  2. CHEATLE, G. L. Paget's disease of the nipple. *Brit. J. Surg.*, 1923, xi, 295-318; 1924, xii, 284-288.
  3. BLOODGOOD, J. C. Paget's disease of female nipple. *Arch. Surg.*, 1924, viii, 461-505.
  4. KILGORE, A. R. Is Paget's disease of the nipple primary or secondary to cancer of the underlying breast? *Arch. Surg.*, 1921, iii, 324-335.
  5. CRAMER, W. New outlook on cancer. *Brit. M. J.*, 1926, i, 175-180.
- NOTE. Since the above went to press a very valuable article which should be read in the original has been published by Muir, *J. Path. & Bacteriol.*, 1927, xxx.



# PRELIMINARY REPORT OF A MODIFIED METHOD OF BLOOD COUNTING FOR THE DETERMINATION OF INFLAMMATORY CONDITIONS\*

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THE hypothetical clinical picture which I am going to draw is one which has occurred in the experience of all practitioners. A patient presents himself for diagnosis with indefinite abdominal complaints, such as nausea, vomiting and pain in the right lower quadrant. The pulse, temperature, and respiration are all within normal limits. There is some tenderness in the right lower quadrant, but there is enough doubt in our minds to make it advisable to confirm our suspicion by

65. Both of these features have such wide variations within the normal that these figures prove of no great value.

Under such circumstances, in many instances diagnosis is delayed in the hope that another white count at the end of six to twelve hours will be more clearly indicative. This delay has been the cause of many deaths, as by the time the white cell and differential count have become clearly indicative of inflammatory processes, the information thus gained may come too late.

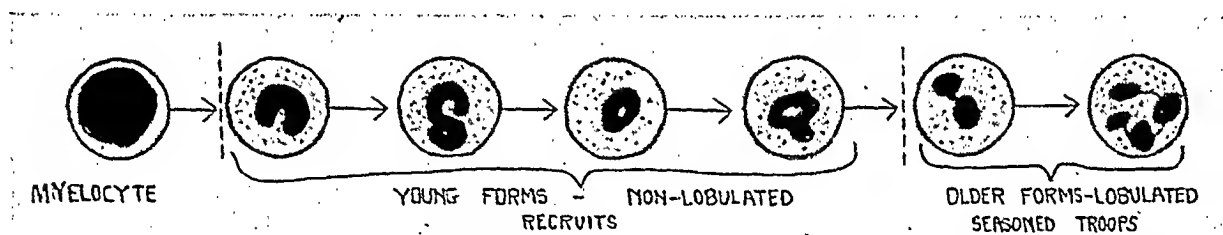


FIG. 1. Scheme of development of the nucleus of maturing polymorphonuclear neutrophile.

resorting to the information which we feel can be gained from a white and differential blood-cell count.

The results of this count are: white cells 10,000, with 70 per cent polymorphonuclears. Knowing that the possible factor of error in a total white count is plus or minus 2000, we realize that this figure may mean 12,000 or 8000. Hence we gain no particularly valuable information from the determination of the total number of white cells. In a like manner, realizing that the factor of error in a count to determine the number of polymorphonuclears is plus or minus 5, we know that the Figure 70 may mean 75 or

The facts that such a large amount of reliance has been placed in a white cell and differential count, and that this method of blood diagnosis has frequently yielded information that was misleading, bring out two important observations: first, that blood counting has lost prestige among diagnosticians, especially in cases of early inflammatory processes; second, there is a distinct need for some method of blood examination that will yield this information at a time when it is a factor of prime importance.

Because I felt that hematology was a weak link in the diagnostic chain from the surgical standpoint, the title of Piney's

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## Roberts—Blood Counting Method

article,<sup>1</sup> "The importance of Hematology in Surgery," rather piqued my interest. After reading it I felt that the theories

in it I am offering to the profession a stout staff in place of the straw, particularly in borderline cases when we feel that some

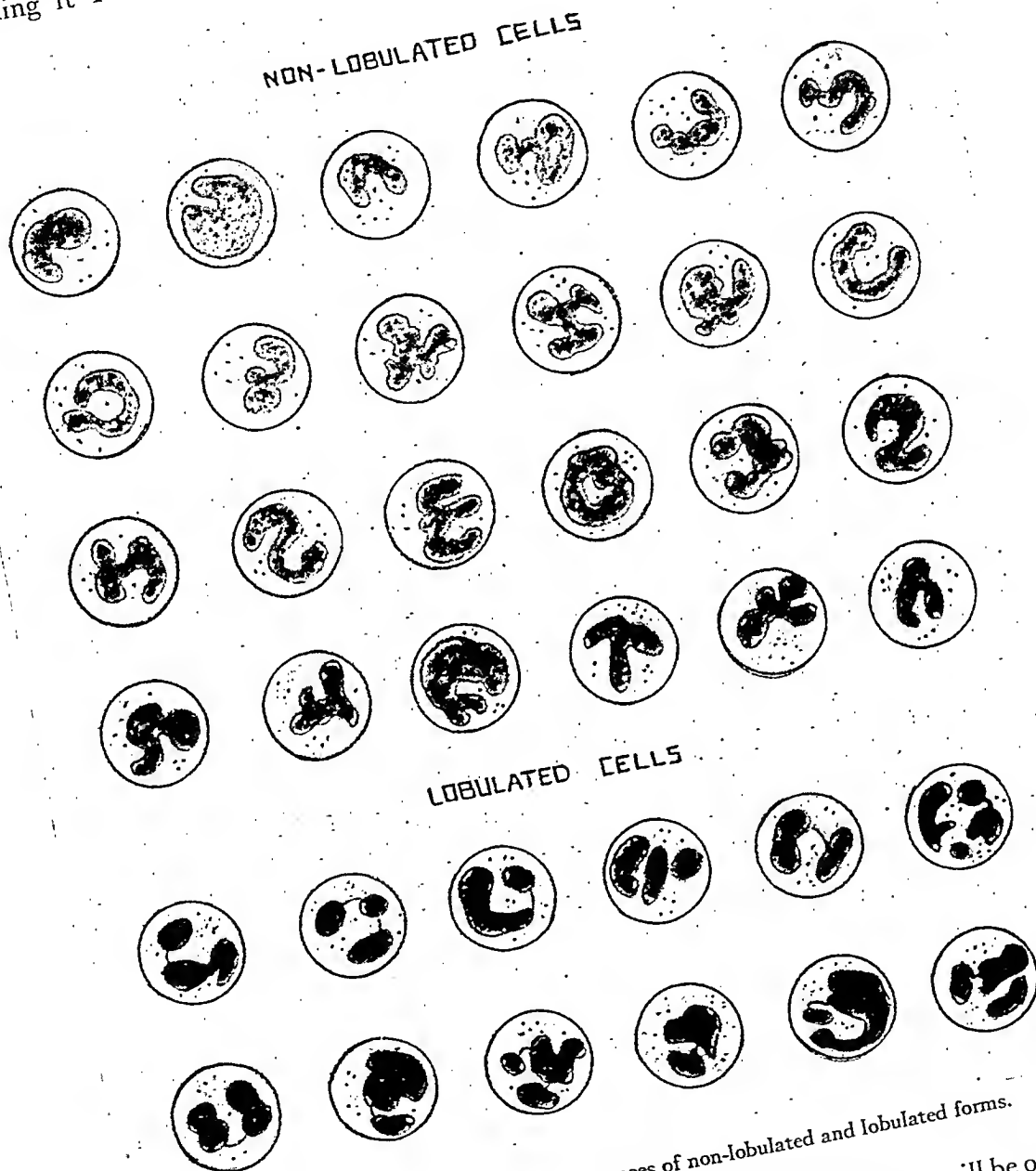


FIG. 2. Diagram showing typical instances of non-lobulated and lobulated forms.

which he advanced were of such importance that the subject warranted earnest consideration. It is as a result of that study that the following modification of Piney's technique is suggested. I hope that

laboratory examination will be of assistance where signs and symptoms are indefinite. We must revise our method of considering the polymorphonuclear neutrophile in inflammatory disease.



Arneth,<sup>2</sup> von Schilling-Torgau,<sup>3</sup> and various other writers, have attempted classifications of these cells with the idea of

the white cells for I believe that such a discussion at this point would only lead to confusion. I am basing my deductions

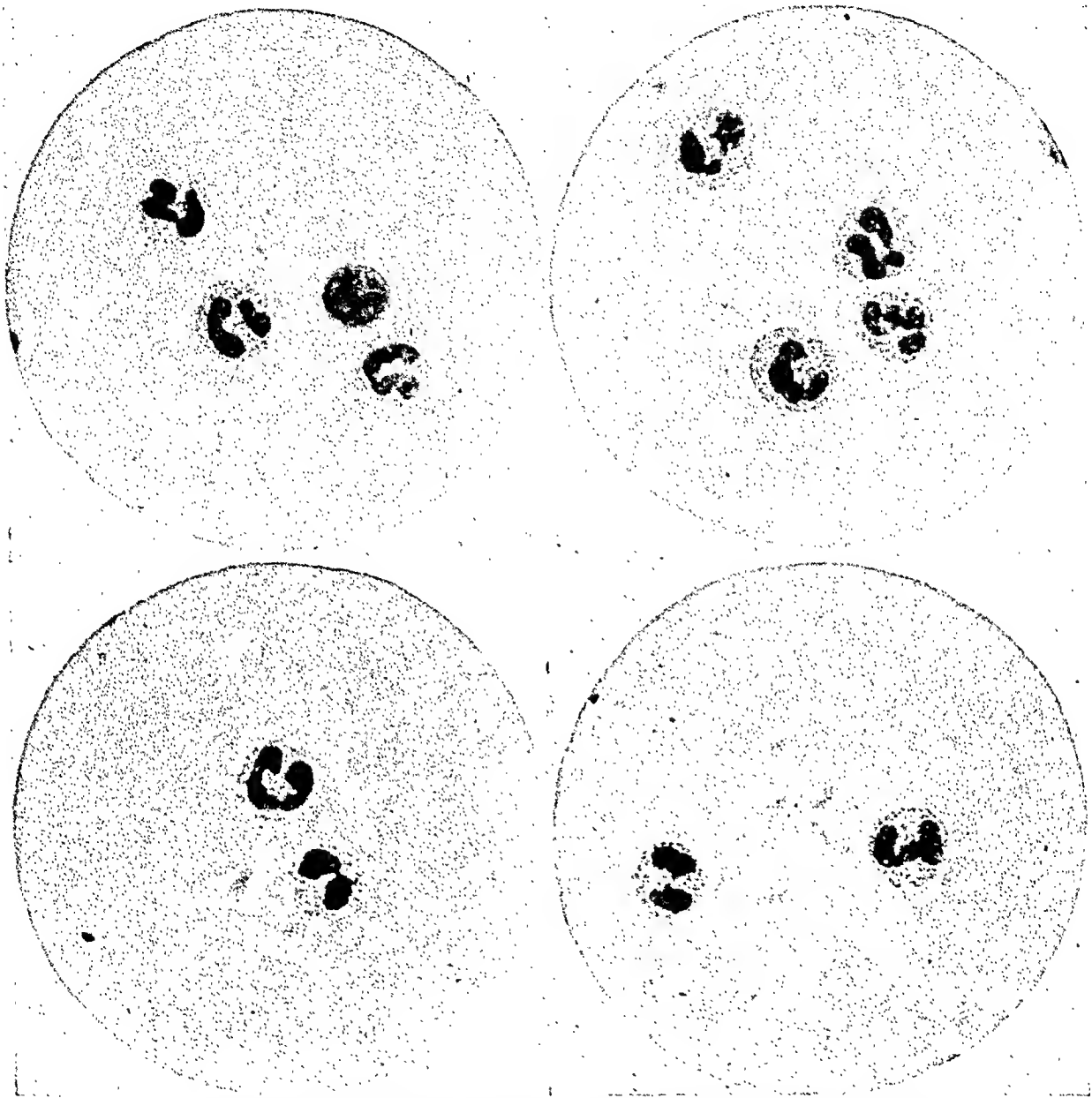


FIG. 3. Photomicrographs (untouched) showing lobular and non-lobular polymorphonuclear neutrophils in the peripheral circulation of a case of septicemia.

determining their relative age. Arneth was the first, but in the hands of most men his classification has proven so complex that its clinical value has been lost. Von Schilling-Torgau's classification was somewhat simpler, as was likewise Piney's, but I felt that there is a possibility of improving on these.

It is not my purpose in this article to enter into any discussion of the origin of

upon that portion of the theory relative to the origin of polymorphonuclear neutrophils which traces their development in the white-blood-cell-forming organs such as the marrow of the long bones, spleen, liver, lymph nodes, and lymphatics of the omentum, from the myelocyte. This portion of the theory of cell origin is accepted by the majority of authorities and I refer the reader for confirmation thereof to any

of the standard textbooks of histology, embryology and pathology. More recently, Sabin has added materially to our knowledge of the subject and her monographs on the behavior of white cells are the finest in the field.

The myelocyte is continually developing into, amongst other cells, the polymorphonuclear neutrophile. This change is accomplished by the addition of neutrophilic granules to the cytoplasm and the typical metamorphosis of the nucleus

gates and becomes the horseshoe-shaped nucleus of the metamyelocyte. Further growth produces the "s" "3" and "o" shaped nuclei of the younger cells. This development progresses and there eventually comes a time when some portion of the nuclear mass is almost completely pinched off from the main nucleus (Fig. 1). Owing to the difficulties and complexities of the previous classifications which created sub-groups for the polymorphonuclears according to the number of

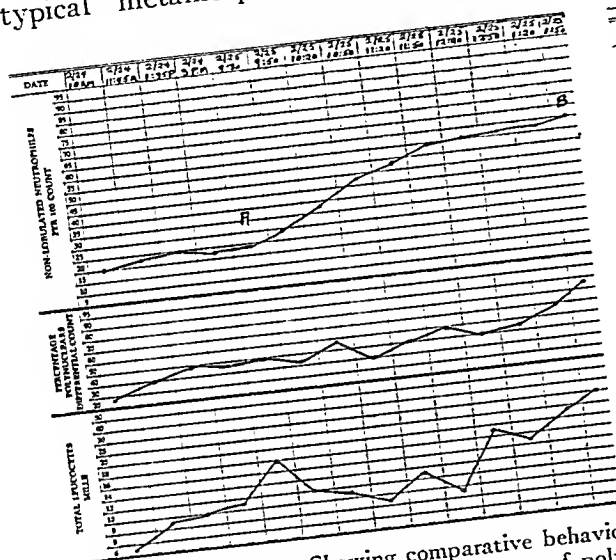


FIG. 4. Rabbit No. 1. Showing comparative behavior of total number of leucocytes, percentage of polymorphonuclear neutrophils and percentage of non-lobulated forms when the peritoneum was injected with 20 c.c. of fresh culture of mixed bacteria from a carbuncle. Culture injected into peritoneum at point A. Rabbit died at point B, following the development of generalized paralysis and acceleration of pulse, temperature and respiration. It will be noted that rise of non-lobular forms occurs before marked rise in percentage of polymorphonuclear neutrophils.

which eventually assumes the characteristic shapes that give the polymorphonuclear neutrophile its name.

It is quite obvious that between the stage of the disc-shaped nucleus of the myelocyte and the characteristic shape of the polymorphonuclear's nucleus there are certain mechanical stages through which that nucleus must go. The disc becomes indented and assumes a somewhat kidney-like appearance. This elon-

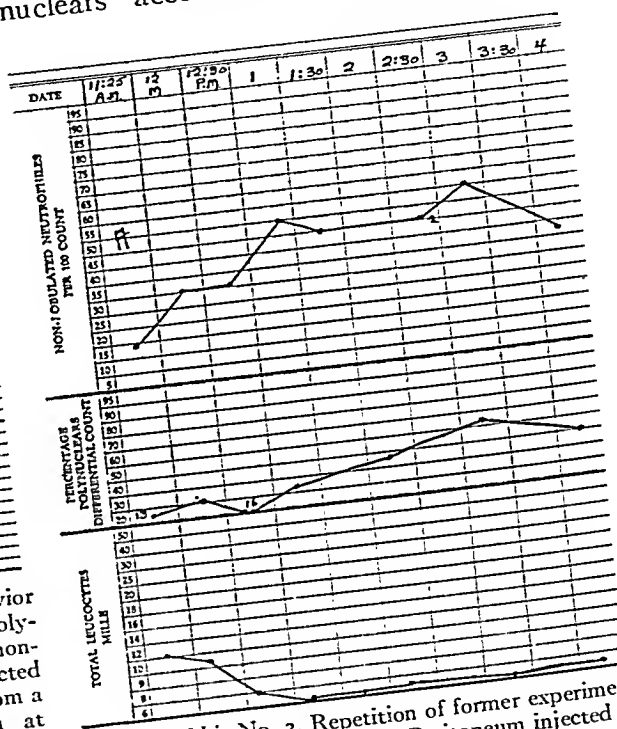


FIG. 5. Rabbit No. 2. Repetition of former experiment using 5 c.c. of fresh culture. Peritoneum injected at point A. This rabbit ultimately recovered.

lobules in the nucleus, or used such terms as "ring" and "band" forms—classifications or sub-groupings that proved confusing to the average worker—it occurred to me that it would be interesting to determine how many of the polymorphonuclear neutrophils in the peripheral circulation had a portion of the nucleus pinched off. So I selected a purely empirical classification and have divided the polymorphonuclears into two groups, those having a portion of the nucleus pinched off, which I call "lobulated" polymorpho-

nuclears, and those in which no such division has taken place, which I call "non-lobulated" polymorphonuclears. To be more concise, I define a lobulated polymorphonuclear as one in which some portion of the nuclear mass is separated from the main nuclear mass by a strand of chromatin, both sides of which are not distinctly visible under the two millimeter oil immersion lens (Fig. 2).

To draw a rather homely simile, the cells that fall within the non-lobular classification are those in which the nuclear picture could be readily reproduced by squeezing toothpaste from a tube continuously. In order to reproduce the nuclear picture of the lobulated cell, it would be necessary to stop this squeezing process and begin at a second, third or fourth point.

This classification is empirical but it has many advantages, the greatest of which is that it can readily be understood, and it has been my experience that with it as a working basis three individuals counting the same slide will not vary more than two or three cells. Figure 3 shows photomicrographs of polymorphonuclears in the peripheral circulation of a case of septicemia and serve to show that this classification is readily made.

The technique employed in this method of blood examination is the same as for the routine differential count. A drop of blood from the lobe of the ear is placed upon a cover glass, a second cover glass is dropped upon the first, they are slipped apart, and the cover glass preparations are air-dried and stained with Wright, Jenner, or the tetrachrome of McNeill. One hundred polymorphonuclear neutrophiles are counted on each cover glass after the usual differential count has been made, the percentage of non-lobular forms is determined and an average of the two figures is taken as the factor for that count. For instance, cover glass A shows 23 out of 100 polymorphonuclears counted to be the non-lobular variety and 27 on cover glass B. This is expressed by saying that there are 25 per cent of non-lobular forms present.

My first problem was to ascertain whether there were any consistency in the percentage of non-lobular forms present in the peripheral circulation of normal humans. For this purpose one hundred and eighteen individuals, who were under observation, were examined, and three counts were made in each instance. The average distribution of these counts reveals that there are in the vicinity of 25 per cent of the non-lobular form under the climatic and atmospheric conditions of Greater New York during December.

I have taken the figure 25 as our average normal, and I believe that the presence of this many or less of the non-lobular forms in one hundred counted, shows that there is no acute inflammatory process present in the individual. The only wide variation from this figure that is non-pathological is in the case of menstruating females in whom the number rises to about 35 per cent.

I have counted the cells in children as young as six days and find the percentage to be about the same. I do not feel that my figures for children at the present time are large enough to warrant any normal. However, it has been my experience, so far, that even in infants of two or three days of age the same proportion

"NORMAL" COUNTS

Age groups	15 years or more
Percentage of non-lobulars	
35	xx
34	x
33	
32	x
31	x
30	xxxx
29	xxx
28	xxxxxxxx
27	xxxxx
26	xxxxxxxxx
25	xxxxxxxxx
24	xxxxxxxxx
23	xxxxxxxxxxx
22	xxxxxxxxx
21	xxxxxxxxx
20	xxxxxxxxxxxxxxxxx
19	xxxxxxxxxxx
18	xx
17	xxx
16	
15	xxx

Distribution of the non-lobular determination in 118 normal individuals.

holds good as for adults. Since white cell and differential counts in children are even more essential than they are in adults this is the phase upon which I am at present working.

The same individual does not vary more than two or three cells during the course of twenty-four hours.

Food does not seem to have any noticeable effect upon this normal figure.

Considering these facts I feel that I am justified in taking the figure 25 as an upper normal limit.

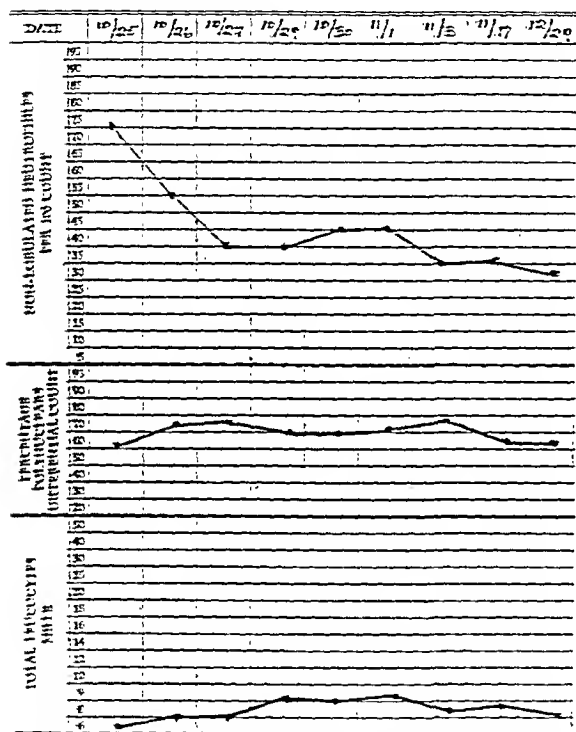


FIG. 6. Case, Miss F. Non-lobular determination done on October 25, 1926. Positive diagnosis of inflammatory condition made, confirmed later the same day by roentgen ray of chest which showed lobar pneumonia. Patient recovered.

The next problem was to determine what happened in the presence of inflammatory conditions. With this end in view I determined the non-lobular percentage of rabbits and found it to be about the same as, or slightly lower than, that in man. I then injected varying amounts of live cultures of pus-forming bacteria into the peritoneal cavity and took counts every half hour thereafter.

Figures 4 and 5 represent typical results of this experiment. From them important deductions may be drawn. First, the usual temporary leucopenia as exemplified by the drop in the total number of white cells, is clearly demonstrated. After the inflammatory process has gone on for some time, the usual rise in the percentage of polymorphonuclear neutrophils occurs, but almost immediately after the inoculation, it will be observed the percentage of non-lobular forms commences to rise and keeps mounting until death occurs or the

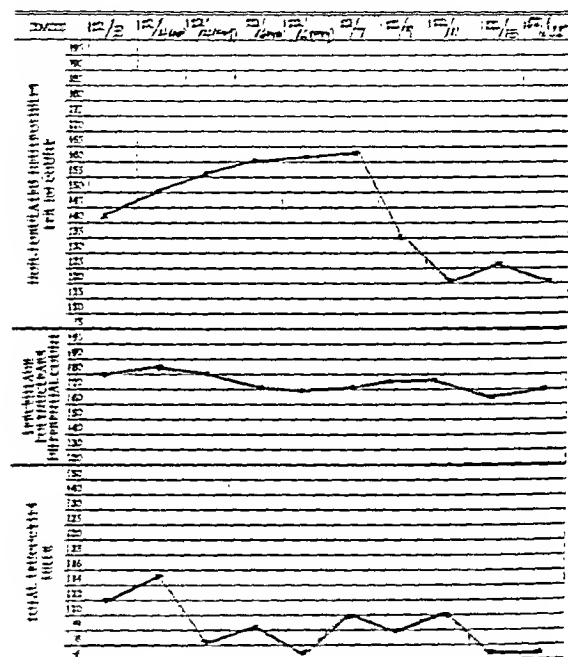


FIG. 7. Case, Mr. M. Non-lobular determination made on December 3, 4, 6, and 7, 1925, showed inflammatory process. Diagnosis confirmed at operation, acute appendicitis. Patient recovered.

inflammatory process is overcome by phagocytosis.

Feeling that the laboratory data needed clinical verification, I attempted diagnostic non-lobular determinations on cases before operation. Thus far I have not failed to make a diagnosis of inflammatory condition when one was found at operation, nor have I called any case inflammatory where operation did not verify this.

Figures 6 and 7 represent charts of two individuals which are characteristic of this series. I have at present only about fifty

eases upon which to base conclusions but in the absence of any contradictory evidence, I feel safe in making the statement that if a non-lobular determination reveals the presence of 35 per cent or more of these forms an inflammatory process is present somewhere in the body.

Since we are watching the systemic reaction to inflammatory processes, we cannot by this method of diagnosis determine where the inflammation is, hence we cannot distinguish between an acute appendicitis and pneumonia, as yet.

inflammatory process, a determination of the non-lobular forms present will give this desired information.

To use a simple analogy, let us assume that we are in a position to observe the front line trenches of our enemy during an engagement. Because of differences in their uniform, it is possible to distinguish the recruit from the seasoned trooper. We find that in a given sector there are normally ten thousand men, 75 per cent of which are seasoned troopers. We launch an attack against the enemy and wipe

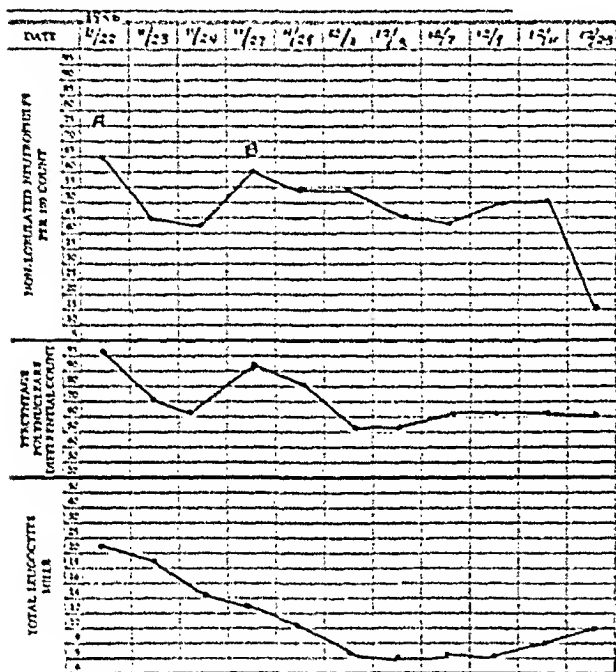


FIG. 8. Case, Mrs. H. Non-lobular determination made on November 22, showed inflammatory process. Diagnosis confirmed at operation the same day—appendiceal abscess. On November 27, abscess on anterior abdominal wall opened. Patient recovered.

Now let us consider a working theory with which to explain the foregoing observations. When the call for phagocytes comes, the white-blood-cell-forming organs pour into the circulation their available polymorphonuclear neutrophils. These polymorphonuclear neutrophils being of the younger variety, fall into the non-lobular group. Hence, before the total number of white cells or the percentage of polymorphonuclears has risen to the point where it is clearly indicative of an

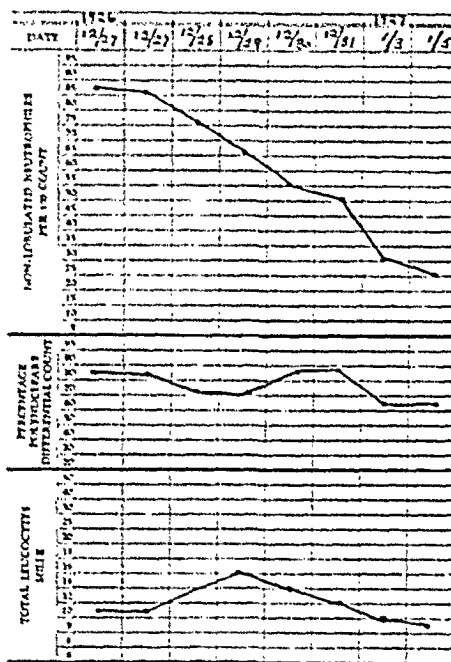


FIG. 9. Case, Mr. G. Non-lobular determination done on November 27. Diagnosis, inflammatory condition confirmed by blood culture; septicemia. Patient recovered.

out 2000 of the men. These men are replaced by bringing up 2000 reserves, among whom 50 per cent or more are recruits. The total number of men in the trench sector will remain the same but the proportion of recruits among them will have risen. As the battle progresses, if the enemy's reserves are adequately prepared and brought into action, the percentage of recruits among the men will not markedly increase and if our attack is mild enough the enemy will eventually reestablish the normal working proportion of 75:25. If, however, our attack is so vigorous that we

overtax his man power, the constant filling of his trenches with recruits will raise their proportion continually until the time may come when practically all of his men are of the more inexperienced variety. This is an extremely unscientific simile but I believe it serves to illustrate quite clearly what goes on in the peripheral circulation in the face of an inflammatory reaction.

In order to test this theory I do a non-lobular determination upon cases of inflammatory disease over a period of two or

The charts clearly illustrate this point (Figs. 8, 9 and 10.)

I realize that the number of cases upon which the foregoing theory is based is small, and it is my intention to follow it along over a period of time. It is in the hope that I may receive the assistance of other workers that this article is presented now. For those who are desirous of testing these theories I suggest the advisability of establishing a normal for each set of working conditions. It is possible that climate and the amount of actinic rays in the sunlight may have some effect upon this normal figure. In a very small series of cases I have found that exposure to the Alpine sun lamp has caused a moderate increase in the percentage of non-lobular forms.

Quite recently I have been making our counts with a 1½ mm. binocular microscope and find that the same slide counted by the same individual, first under 2 mm. and then under a 1½ mm. lens will yield slightly lower figures for the higher magnification. I suggest that higher magnification is of no great advantage as such high power is not usually available for average practitioners.

To those trained in ultra-scientific research methods the foregoing article will appear elementary, possibly even crude, but I wish to call attention to the fact that if this diagnostic aid is to be of far-reaching influence it must be made available to the diagnostician who may not have facilities of a research laboratory at his disposal but carries in his armamentarium a microscope with a 2 mm. oil immersion lens.

CONCLUSIONS

A determination of the percentage of non-lobular forms among the polymorphonuclear neutrophils in the peripheral circulation is of value because:

- 1. It is a classification that is simple.
- 2. It will give a positive diagnosis of an inflammatory disease earlier than the usual white and differential cell count.
- 3. The information thus gained is of

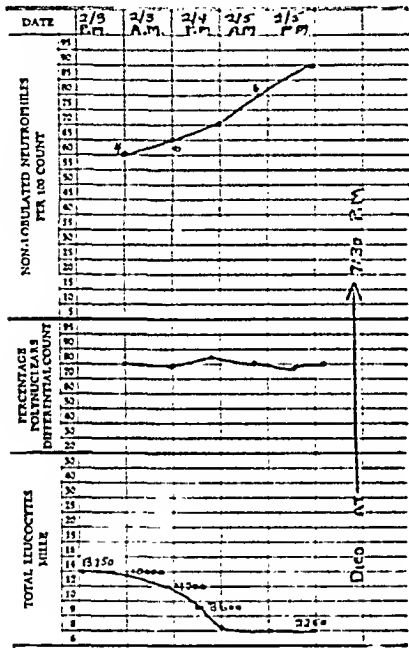


FIG. 10. Case, Mr. B. Showing results of non-lobular determination over a period of forty-eight hours following operation for drainage of peritoneal cavity due to ruptured appendix and generalized abdominal peritonitis. Death at 7.30 p. m., February 5.

three weeks, taking a count every twelve hours in some instances, and every twenty-four in others, and it has been my experience that as long as the percentage of non-lobular forms remains higher than normal or is rising, the prognosis of that case must be guarded, because it indicates that the white-blood-cell-forming organs are being severely taxed. On the other hand, if during an inflammatory process the percentage of non-lobular forms decreases, the prognosis is favorable because the reverse of the previous proposition is true.

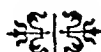
great prognostic value in following the course of an inflammatory condition.

I wish to express my thanks to the members of the Fifth Avenue Hospital Staff who have kindly allowed me to study their cases from this standpoint as well as to Dr. Jessup and Miss Pratt, the technicians and Miss Phillips, Miss McCollum and Mrs. Woese who have worked arduously with me, likewise to Mrs. Arthur Huey and Mr. L. W. Lawrence

whose donations made this investigation possible.

#### REFERENCES

1. PINEY, A. Importance of haematology in surgery. *Brit. J. Surg.*, 1926, xiv, 9-35.
2. ARNETH. *Die Qualitative Blutlehre*. Leipz., Klinkhardt, 1920.
3. VON SCHILLING-TORGAU. *Das Blutbild u. s. klin. Verwertung*. Ed. 3, Jena, G. Fischer, 1924.
4. Sabin, F. R., et al. Studies on maturation of myeloblasts into myelocytes and on amitotic cell division in peripheral blood in acute myeloblastic leucemia. *J. Exper. Med.*, 1924, xl, 845-871.



### DIAGNOSIS OF A TUBERCULOUS KIDNEY.

The most deceptive feature is the complete absence of pain in either kidney until the later stages of the disease. It is difficult to realize that one of the kidneys may be eaten up with tuberculosis although there has been no complaint of pain in that kidney. Not until disease has been present for a year or two may one of the kidneys become painful and ache. Yet the painful aching kidney may be the healthy hypertrophied one. The healthy kidney may ache because it is heavy, having increased to double its size, and because it is doing double the work. It is often difficult to persuade the practitioner and the patient that the aching kidney may be the healthy kidney.

Occasionally there is true renal colic on the side of the diseased kidney, set up by the passage of cheesy material down the ureter. Nevertheless, renal pain is usually absent, and the only common and characteristic pain is that experienced at the neck of the bladder or in the end of the penis at the finish of micturition. Accompanying this pain is the most constant symptom of all, greatly increased frequency of micturition. This increases continuously and is not usually marked by intermittence over periods of weeks or months, as is the case with increased frequency set up by other forms of chronic infections of the kidney and bladder.—FRANK KIDD in *The Practitioner*.



# THE TREATMENT OF ACUTE SUPPURATIVE PLEURISY IN CHILDREN\*

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## PECULIARITIES OF SUPPURATIVE PLEURISY IN CHILDREN

THE treatment of suppurative pleurisy in children has received but little attention from those writing on this subject, as such cases have usually been included in adult groups. There are certain features, however, that differentiate these groups, the most important of which are:

1. Thickness of chest wall.
2. Diminished power of resistance.
3. Cooperation of patient.
4. Nature's ability to repair in childhood.

1. *Thickness of Chest Wall.* In the average child suffering from suppurative pleurisy, the thinness of the chest wall, when exaggerated by emaciation, has some operative advantage.

(a) Diagnosis is more exact in outlining the encapsulated pocket, both by physical signs and by roentgenography and fluoroscopy.

(b) An underlying pneumonia is readily detected, which is of vast significance in determining the question of operation.

### 2. *Diminished Power of Resistance.*

(a) Most children with suppurative pleurisy do not have enough power of resistance to withstand the shock of any severe operation, so the simplest efficient operation is demanded. Even the shock of dressing the wound is vitally significant, and particularly so during the first few days after operation. In these cases it is of the greatest importance to use simple tubes that are held in place in a position that does not irritate, and yet are effective.

(b) In very young children suffering from suppurative pleurisy, where mortality is exceptionally high, forced feeding before and after operation is often necessary. When these children, who refuse food, are gavaged, regurgitation follows. This occurs in very sick patients whose emaciation would indicate a long period of starvation. Apparently during their primary disease, when feeding is difficult, their stomachs contract. This contraction is overcome by frequent feedings of small amounts which are gradually increased in quantity. This treatment requires constant nursing, but it is the means of saving life.

With the exception of the first few days after operation, it rarely is necessary to urge eating, as a properly drained empyema patient will consume large quantities of food. The dietary must be of high caloric value and the food should be given in as great a quantity as the child's gastrointestinal tract will assimilate. The reasons for requiring so much food are: to overcome loss of weight due to the emaciation which obtained during the primary disease and the formative period of the suppurative pleurisy; to overcome the negative nitrogen balance that is always present in underfed suppurative pleurisy cases; and to supply warmth to overcome the extra loss of heat that is concomitant with an open pneumothorax.

3. *Cooperation of the Child.* This is necessary and can be obtained by some simple device such as a toy balloon used in place of the customary blow-bottle.

To prevent spinal curvature, which is

\*Read in part before the Section of Surgery, New York Academy of Medicine, February 4, 1927. An abstract of this paper, and the discussions, were published with the Transactions of that meeting in THE AMERICAN JOURNAL OF SURGERY, May, 1927.

likely to occur, get the child out of bed as early as possible. Encourage him to run until short of breath, which will create deeper breathing with greater expansion and better drainage. Exercise in any form is particularly desirable. Balcony sunlight treatment, after acute symptoms have subsided, is of great value. The average child will cooperate, so this may be carried on even in mid-winter.

In children the reaction to exposure is very noticeable and it is out of all proportion to that of adults. It is most vital directly after operation and for the next four to six days. The percentage of complications is very much higher in windy winter months, which is due to exposure to cold and prevalent infections.

4. *Nature's Ability to Repair in Childhood.* In suppurative pleurisy, as in many other diseases of children, growth is a great adjunct to the final result. If there is a curvature or a flattening of the chest or incomplete expansion of the lung this fault will be gradually overcome as the child develops.

The management of suppurative pleurisy is based on possibilities and directed by probabilities. The plan of treatment should fulfill the following requirements and, in so far as it yields good results, must be accepted as satisfactory:

1. Proper treatment of the primary disease with early recognition of the suppurative pleurisy.
2. Low mortality.
3. Minimum anatomical and physiological deformity.
4. Prevention of complications.
5. Early restoration to health.

In comparing treatment of suppurative pleurisy by different surgeons, with that of a suppurative process in the peritoneal cavity as, for instance, suppurative appendicitis, we are forced to the conclusion that there are still worlds to conquer in the realm of suppurative pleurisy.

Practically all agree on the general plan of treating suppurative appendicitis, but only in a few general principles are

surgeons agreed in the treatment of suppurative pleurisy. All believe in the dictum of "where there is pus, let it out." However, the time to act; the amount of pus to be removed at the operation; the method of attack, whether by rib resection, simple thoracotomy, exploratory thoracotomy, with removal of foreign substance (congealed fibrin); the method of drainage, whether by the closed suction method, syphon drainage, double drainage, through and through drainage tubes; aspiration with injection of bactericidal agents; the placing of Dakin tubes in the cavity so all parts may be irrigated and disinfected; these are a few points on which we are not fully in accord.

Every writer wishes to impress the fact that prevention of chronic empyema is one of our chief aims; yet we all continue to operate on chronic suppurative pleurisy, and we believe that a certain percentage, varying with the particular pathology, will continue to develop chronic suppurative pleurisy. In other words, it is the particular type of suppurative pleurisy rather than the particular type of operation that is the determining factor.

#### COMPLICATIONS CAUSING CHRONICITY

Many of the complications that prevent closure of the chest wall, such as osteomyelitis of rib, inadequate drainage, foreign bodies and multiple pockets can be controlled by adequate surgery. A few, however, will develop a chronic form in spite of the management of the acute. We refer particularly to those cases with (1) large bronchopulmonary fistulae; (2) interstitial changes in the pulmonary parenchyma; (3) multiple septic foci in the lung which apparently, from time to time, rupture through the visceral pleura and reinfect the cavity; (4) primary tuberculosis or a secondary infection with tuberculosis.

The pathology of suppurative pleurisy does not come within the scope of this paper and will be referred to only by statements of accepted ideas, insofar as

it is inseparable from a discussion of treatment.

1. With the use of Dakin solution we frequently find a more or less sudden appearance of a *bronchopulmonary fistula*. At first we thought that the solution had eroded a spot of partially devitalized lung tissue. A more probable explanation is that the fistula developed during the course of the disease but had been temporarily closed by the thick layer of fibrin that adhered to the visceral pleura. When this became detached the fistula suddenly appeared. This is illustrated by the following case:

CASE I (234 D-4). A child of two years, in whose case the regular two-hourly Dakin's irrigation was not used but the wound was daily irrigated at the time of dressing. This was without ill-effect for several days. Later, when the solution was introduced, the patient became "gassed" on account of the opening of a fair-sized bronchus. There was a severe paroxysm of coughing; the child strangled, became cyanotic and developed marked shock from which it did not recover. Death is very uncommon from such a cause.

Small pulmonary communications close spontaneously and are not a cause of chronicity. For instance, in doing a decortication, the parenchyma is invariably damaged enough to cause bubbles to appear. If irrigation is started at once the patient becomes "gassed," but in three to six days after operation it is perfectly safe to institute this treatment.

When a large bronchus communicates with the pleural cavity it will not close spontaneously. This is illustrated by the following case:

CASE II (299 D-4). A boy, aged six years, suffering from post-tonsillectomy pneumonia, who did not recover in the usual time, developed signs of fluid in the chest. A roentgenogram confirmed this diagnosis and an exploratory puncture revealed pus. The operation showed that a lung abscess had spontaneously ruptured into the pleural cavity, producing an encysted suppurative pleurisy. This wound had every advantage for spontaneous closure but resisted all efforts and

developed a chronic state. It, of course, rightfully belongs in the class of lung abscesses, but with its resulting bronchopulmonary fistula it serves to illustrate in a magnified way the fact that when the pleural cavity communicates with lung parenchyma it will not spontaneously heal if that communication is of any appreciable size.

Thus we have two extremes: first, where chronicity is practically unavoidable; second, where the openings are small in collapsible tissue with spontaneous closure. The determining factor is the size and location of the communication. I am convinced that certain cases do not have such an easily demonstrable pathologic process which undoubtedly accounts for our failure to prevent chronic suppurative pleurisy.

2. *Interstitial Changes in the Pulmonary Parenchyma*. There are few cases in which the lung will not expand. In these cases the roentgenogram shows marked changes in the parenchyma together with thickening of the pleura. When decortication is done the lung does not expand in the usual manner. There is an accompanying bronchitis, and the sputum is persistently negative for tubercle bacilli. By prolonged Dakinization the chest wound finally closes leaving an apparently sterile pneumothorax.

CASE III (365 D-4). A girl, two years old, who had thickening of the pleura and some interstitial changes in the lung. Her condition was not good enough to warrant an exploratory thoracotomy with decortication of the lung. This patient was thoroughly Dakinized until smears from the cavity showed few organisms and her chest wound was allowed to close. However, she continued to show an unexplained temperature elevation. The pneumothorax was sterile so the temperature was due to other causes. Gradually it subsided and the pneumothorax disappeared. It took about six months for the lung to expand completely and fill the chest. Eventually the pleural thickening disappeared.

In some other cases the pneumothorax did not become obliterated, due to the marked interstitial changes in the lung

parenchyma and recurrence in such cases is inevitable.

CASE IV (304 D-4). A boy, aged eight years, was admitted on April 16, 1921, to the Pediatric Service, Bellevue Hospital, with pneumonia; on May 9 a thoracotomy was done, fifty ounces of pus were removed and a colon bacillus was recovered. This case ran a very unsatisfactory course with elevations of temperature, considerable cough and expectoration. The sputum was negative for tubercle bacilli. The chest wound ultimately closed after prolonged Dakinization with a small pneumothorax persisting, and the patient was sent to the country July 19. On July 29, he was readmitted to the hospital with fever. Roentgen-ray examination showed a small effusion in the lower portion of the right pleural cavity and a thickening of the pleura. The wound was opened, considerable pus was evacuated, the cavity was Dakinized. On August 28, the patient was again discharged in good condition with the wound closed. On September 23, he was again readmitted and a roentgen-ray examination showed a small collection of air in the right pleural cavity, also fibrosis of the right lower lobe with marked thickening of the pleura. On September 29, exploratory thoracotomy revealed a small amount of pus with marked thickening of the pleura. This patient cooperated and every effort to expand the lung was made. On October 12, he was discharged for the third time. Roentgenograms then showed no pneumothorax, but did show interstitial lung changes. Physical examination suggested a bronchiectasis. On June 16, 1922, he was again readmitted. A sinus was found at the site of the scar and a further roentgen-ray study revealed more interstitial changes in the right lower lobe. An exploratory thoracotomy showed a small pneumothorax but no loculi of pus. This wound eventually healed and the patient has remained well to the present time. This case, which received routine care in dealing with acute suppurative pleurisy, developed chronic suppurative pleurisy, due to the lung having lost its ability to expand properly and to fill completely the pleural cavity.

### 3. *Multiple Septic Foci in the Lung Which Rupture and Reinfect the Pleural Cavity.*

CASE V (1558 D-4). A boy two and a half years of age, admitted January 24, 1921, to

the Pediatric Service, Bellevue Hospital, with lobar pneumonia of the upper left lobe. This patient developed a suppurative pleurisy and was operated on March 3. A moderate amount of pus was evacuated and the culture showed pneumococci. In eighteen days the wound had entirely healed and the lung fully expanded. One week later he was transferred to the medical service with pneumonia of the right lung and on April 14 he was returned to the surgical service and operated on the left side (recurrent suppurative pleurisy); a large amount of pus was found and a culture again revealed pneumococci. Following the operation for recurrence, this patient had a stormy career. He would have periods of normal temperature, take food readily, respond to blood transfusions and encourage us to believe him on the road to recovery. This was followed by periods of reinfection and the wound again discharged profusely. He had a poor appetite and fever. The pleura was so thick that physical, roentgenographic and fluoroscopic examinations were decidedly unsatisfactory from a diagnostic point of view.

The condition of the patient did not warrant an exploratory thoracotomy but it was hoped he would eventually reach a stage of being a reasonable operative risk. It was suspected that this patient had multiple loculi or subpleural abscesses, which continued to develop. One month after operation for recurrence, a pocket of pus was found at the level of the left fourth interspace anterior to axillary line. This was drained by an additional incision as it had no communication with the former pocket. Pneumococci again appeared in the culture. The original incision in the seventh space was still open but draining a very small amount of thin seropus. The patient continued an up-and-down course for two months, repeated transfusions keeping up his constantly declining vitality. No definite evidence of further developing loculi could be diagnosticated.

The case eventually terminated by the development of an acute nephritis with marked general anasarca. Fortunately, an autopsy was performed. A partial protocol follows: On opening the pleural cavity, the left lung was found to be partially collapsed. The pleural cavity on the left side showed both surgical incisions to be wide open and there was good drainage so there was no pus in the chest cavity. The lung was firmly bound to the

chest wall in the upper and posterior portions. On removing the lung, the pleura was found to be markedly thickened. On section, the lung was dark red in color and studded throughout by numerous abscesses varying in size from one-fourth to one-eighth of an inch. The right lung was firmly bound to the chest wall throughout its entire extent by numerous adhesions. The pleura over this lung also was markedly thickened. The other organs were practically negative except the kidneys which showed an acute nephritis.

This was an extremely interesting case and was followed closely from the beginning of the illness to its termination. Had this child not developed a terminal nephritis he would have developed a chronic suppurative pleurisy, and from a cause that surgery was helpless to prevent.

4. *A tuberculous infection as a cause of chronicity is illustrated by:*

CASE VI (308 D-4). A boy, aged eight years, admitted February 14, 1922, to the Pediatric Service with bronchopneumonia. He was transferred to the surgical division and roentgen-ray and physical examination revealed an encapsulated suppurative pleurisy. He was operated upon February 20. An intercostal incision was made and a large quantity of pus containing pneumococci, group 1, was evacuated. Considering his long period of severe illness the patient was in good condition. There was no apparent reason why he should not have recovered promptly, especially as he was at an age where statistics show a favorable prognosis. Thirty days after the operation there was no discharge. The drainage tube was discontinued and the wound closed. Three days later he developed a rise of temperature and the tube was reinserted. This had to be repeated several times. Each time we believed the chest would permanently close. Roentgenograms and fluoroscopic examination did not reveal the cause of this condition. Eventually an exploratory thoracotomy revealed a small cavity that was being drained by the original incision, no undrained loculi were found. We did a partial decortication of the lung by criss-cross incision and blunt dissection of the thickened pleura. The lung then expanded and filled the pleural cavity. A specimen of pleura removed at operation did not show it to be tuberculous, nor

did a specimen taken one month later. However, the wound refused to heal although there was practically no cavity. A probe was passed far into the chest and an endoscopy showed the sinus to run along the posterior gutter toward the apcx. An examination of the granulation tissue showed it to be tuberculous. Although two subsequent operations were done, this case drifted into the chronic class and has a discharging sinus at the present time.

Whether this was a primary tuberculosis or, what is more likely, a tuberculosis grafted upon a pneumococcus suppurative pleurisy, it is impossible to determine.

The case just cited presents a condition very difficult to control. This patient has been given recognized surgical treatment combined with quartz lamp therapy and the best hygienic care. He has remained in fair physical condition, but still has a small draining sinus.

#### TREATMENT

Our general plan is as follows:

In the formative stage, if there is distress, repeat aspiration as often as necessary. In a few instances, in streptococcus cases, where the reaccumulation of pus is very rapid, the air-tight syphon drainage or suction method is used, but this is not entirely satisfactory; repeated aspiration is the better plan.

When the fluid is frank pus and, as is often the case, the temperature from the pneumonia has abated, open drainage is instituted.

Intercostal drainage with the so-called "flapper tube" is the method used. A "flapper tube" is made by fitting a glove finger (one that has been softened by repeated sterilization) on the distal end of a fenestrated rubber tube as a projection, the tube having been cut with a sixty degree bevel, forming a valve that readily allows fluid and air to escape with expiration but closes with inspiration. This is an aid in lung expansion as it tends to restore the negative intrapleural pressure, and is of use in irrigating at the time of dressing as it forms a funnel through which irrigating fluid is passed into the chest cavity. This principle of valve action

is mentioned by various authors. Mathews speaks of it when he shows how the tissues tend to fall together and form a valve, which is aided by a dressing that is wet from drainage.

The same principle is used by Soresi,<sup>1</sup> who employs a metal tube with a rubber flapper valve. Mechanically, it is a more perfect valve, and it has the advantage of a projecting nipple which can be attached to a bottle by means of a rubber connecting tube thus keeping the dressing clean and avoiding the trauma of redressing. This is of distinct advantage in very sick patients, especially for the first few days after operation. It has also a distinct advantage over the Kenyon syphonage in that the patient is not anchored to the bottle, but the bottle to the patient, making it possible for free movement in any desired position.

The operation for suppurative pleurisy is always done with local anesthesia. The patient, if not too sick, is allowed to sit up; cooperation is more likely to be had with him in this position.

By preference a small incision is made in the seventh intercostal space near the mid-axillary line although the site of the incision naturally varies with the location of the pus. A "flapper tube" is introduced and the pus is allowed to run out. The tube is held in place by one silkworm gut stitch. At no time have there been disturbing symptoms caused by completely evacuating the cavity at operation.

Of course dressings become saturated the first few days after operation and must be changed frequently. At this stage the syphon drainage is much cleaner and easier for the surgeon, but the patient is not as comfortable, nor does his wound drain as efficiently. Irritation is started in the next few days, the exact time depending on the condition of the patient and the amount and the character of the drainage.

<sup>1</sup> Soresi, A. L. Correct conception of thoracic empyema and its rational physiological treatment. *Med. J. & Rec.*, cxxi, 460-465; 524-527. Late results in empyema thoracis in children operated on by the author's method. *Am. J. Surg.*, 1926, n.s. i, 68.

Usually on the fourth day the cavity is irrigated, the patient reclining with wound uppermost. Saline solution is introduced through the "flapper tube," the measured amount determining the size of the cavity. If no coughing is produced, Dakin's solution is then used cautiously. If there is no "gassing," the cavity is daily cleansed by thorough irrigation with Dakin's solution. This daily irrigation is not an attempt to sterilize the cavity, but is sufficient to keep thin and deodorize the discharge. Our experience with more complete Dakinization has been quite similar to that reported by many others. Even under ideal conditions it has not materially shortened the time for complete closure of the wound.

This simple procedure has effected a cure in about eighty per cent of our cases. The time of hospitalization ranges from fifteen to fifty days. None of the patients in this series was discharged while dressings were necessary. By this many recurrences were prevented.

When, judged by temperature, appetite, type of discharge and general condition, it is found that the patient has not materially improved at the end of eight or ten days, and there is no acute otitis media or recurrence of pneumonic process, we conclude that we are dealing with a complicated form of suppurative pleurisy, such as multiple loculi or a markedly thickened pleura, preventing complete drainage. Then an exploratory thoracotomy is done.

The patients are especially prepared for this operation; if anemic, they are transfused. As a routine measure they are partially digitalized.

Under light ether or gas anesthesia, an intercostal incision is made long enough to give proper exposure, and a rib spreader is introduced. If more exposure is required, a rib may be cut at one or both ends and telescoped. This gives the advantage of visual guidance for dividing the vicious adhesions, doing a partial decortication or any other procedure necessary, thus converting multiple loculi into a single cavity,

or placing drainage where it is needed. This may appear to be radical surgery but, properly done, it produces little shock, reduces mortality, shortens convalescence and causes no deformity.

In our series this has been done in twenty-five cases with only one mortality. This patient was a small colored boy with 4-plus Wassermann reaction. Transfusion was not available. The wound broke down, causing a large open pneumothorax, which would not heal. He died twelve days after operation.

The statement has been made that a lung expands because negative pressure in the pleural cavity compels it to expand. That the negative pressure plays a part is not denied, but it is only a minor part. The most potent factor is the intratracheal pressure, which is transmitted to the lung tissue. This is easily demonstrated. For instance, when doing an exploratory thoracotomy with the pleural cavity fully exposed, we see the lung expand and contract. Furthermore, in doing a decortication, the lung expands under vision, and if the patient is allowed to cough when only partially decorticated, there is danger of the lung herniating through the incision in the thickened pleura. All this in the presence of an atmospheric pressure. That the lung does not expand in the presence of a pneumothorax or positive pressure in a closed pleural cavity is, of course, axiomatic. A lung expands more easily in the presence of a negative pressure although it expands to a surprising degree in atmospheric pressure provided there is an opening sufficiently large for the easy and quick exit of air contained within the cavity.

I am convinced that the important factor in curing a suppurative pleurisy is lung expansion and that the element obstructing lung expansion is usually a thickened pleura. Therefore, any treatment that will prevent or, when once established, remove a thickened, unyielding pleura will hasten lung expansion, and following this, closure of the chest.

## PROGNOSIS

It is very difficult to make a classification of suppurative pleurisy cases, but for clinical purposes they may be divided into three groups.

1. Cases having good prognosis.
2. Cases having poor prognosis.
3. A middle group whose prognosis is largely dependent upon the kind of treatment received.

1. *Good Prognosis.* In this clinical grouping about forty per cent of the patients come under the heading of good prognosis. By this is meant that the patient has inherited a healthy constitution, has been surrounded by fair conditions during health, the primary disease was promptly and properly diagnosed and treated, and developed encapsulated suppurative pleurisy, which in turn was promptly diagnosed and received proper care during the formative period of the disease. Such patients will recover if they are given adequate drainage by any of the methods advocated. The period of invalidism will be minimum. The type of organism is a minor matter. Recovery statistics in this group are very gratifying.

2. *Poor Prognosis.* In this group, our series at Bellevue Hospital shows about twenty-five per cent. Through the Social Service Department, we have found living conditions bad, unhealthy parents, dirty unsanitary homes, under-feeding and exposure. Rickets is almost universal. Add to this background a virulent infection, the primary disease improperly diagnosed, a starvation diet, and the child sent to the hospital only when in extreme condition. Such cases, with an encapsulated suppurative pleurisy, will often do surprisingly well if given adequate drainage and plenty of food. But in a patient with a virulent infection with complicated pleural involvement, or one who has already developed complications such as acute otitis media, or pneumonia of the opposite lung, the prognosis is universally bad regardless of the type of operative procedure.



3. *Middle Group where Prognosis is much Dependent upon Surgical Procedure.* The remaining thirty-five per cent fall in this group. In this class, where the background has been only fair, the treatment of the primary disease good, but the infection virulent, the surgical treatment largely determines the ultimate outcome.

The order of treatment in suppurative pleurisy is, first, adequate drainage; second, skillful nursing and high caloric diet; third, blood transfusion. The latter requires a specialist; not mere technique, as that can be easily mastered, but careful judgment is required in determining when and how much blood should be given. It is more difficult to determine these points in children than in adults.

Only whole blood, is given and by the Lindemann method. With whole blood, accurately matched and given in proper amounts reactions are seldom seen. The circulating fluid is quickly brought up to the standard and it acts as an efficient tonic, which makes it possible to take greater amounts of food and in turn metabolize it. This is a most important factor in recovery.

In any case of secondary operation, it is our routine to give a preliminary transfusion. We have found it an excellent prophylactic measure, and without doubt, it has been the determining factor in many cases and has shortened the period of convalescence in many more.

In this series fifty cases were transfused, many having two or more transfusions. Had donors been available many more would have received the same treatment.

The greatest number of transfusions to be given any one case, was fourteen. It was an interesting case to follow. Blood transfusion was the therapy that prolonged life and made recovery almost in sight, even in this septic case. Following each transfusion the patient took more food and showed marked signs of improvement, but could not overcome the infection and died four months later.

## MORTALITIES

A statistical analysis has not been the aim of this paper, but to determine the results of the above outline of treatment, a few statistics are here presented.

	No.	Died	Cured	Mortality per cent
1920				
Age 0-2	15	5	10	33 $\frac{1}{3}$
2-6	19	2	17	10 $\frac{1}{3}$
6-12	10	0	10	0
Total.....	44	7	37	15.9
1921				
Age 0-2	7	3	4	42
2-6	16	2	14	12 $\frac{1}{2}$
6-12	7	1	6	14
Total.....	30	6	24	20
1922				
Age 0-2	9	3	6	33 $\frac{1}{3}$
2-6	16	1	15	6 $\frac{1}{4}$
6-12	7	0	7	0
Total.....	32	4	28	12 $\frac{1}{2}$
1923				
Age 0-2	2	0	2	0
2-6	10	2	8	20
6-12	3	0	3	0
Total.....	15	2	13	13.3
1924				
Age 0-2	15	6	9	40
2-6	12	1	11	8.3
6-12	6	0	6	0
Total.....	33	7	26	16 $\frac{1}{3}$
Total for series.....	154	26	128	16.8

A glance at this table shows readily the fallacy of conclusions drawn from a small number of cases during a short period of time. Thus in 1923 the mortality in infants was nil, while in 1924 it was 40 per cent. For the entire time extending over five consecutive years it was 35.4 per cent. The number of infant cases was forty-eight, the exact number also reported by Ladd and Cutler,<sup>1</sup> with the same percentage of mortality.

The mortality for the entire group as shown in the table is 16.8 per cent. This is somewhat higher than expected, due to

<sup>1</sup> Ladd, W. E., and Cutler, G. D. Mortality from empyema in children. *Surg., Gynec. & Obst.*, 1924, xxxix, 429-431.

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the large number of infants in the series. The mortality excluding infants (106 cases with 9 deaths) is 8.49 per cent; in the group from two to six years (73 cases with 8 deaths) is 10.9 per cent; and in the group from six to twelve years, which is universally found to be the lowest of any age (33 cases with 1 death) 3.3 per cent.

In computing these statistics, only cases that were operated upon were included. In the total number of deaths (34) unfortunately only a few autopsies could be obtained. Consequently it was impossible to determine the exact cause of death in each case.

Of these fatal cases:

One died suddenly during convalescence, evidently from an embolus.

One went into severe shock from "gassing" while being irrigated with Dakin's solution, and did not recover.

In one whose chest was still draining but had no retention, a generalized peritonitis was discovered post mortem, but no foci of the peritoneal infection were found.

Two cases had severe nephritis with marked anasarca.

One had cerebrospinal meningitis.

One died six hours after blood transfusion, there being severe shock induced by the transfusion.

One had pneumonia of the opposite side, followed by suppurative pleurisy on that side.

One had severe laryngeal diphtheria.

One had cellulitis of the arm.

One had osteomyelitis of the tibia.

Five had pneumonia of the opposite side.

Ten had acute otitis media.

In all of these cases severe toxemia was the picture presented, and this was the real cause of death, either from the suppurative pleurisy or from the complications.

## SUMMARY

1. The treatment of acute suppurative pleurisy in children differs from that in the case of adults.
2. High calory diet is an essential to overcome negative nitrogen balance.
3. Repeated aspiration during formative stage for relief of distress is advised.
4. Intercostal incision and drainage is a method of choice.
5. Only local anesthesia should be used.
6. A "flapper tube" aids materially in lung expansion.
7. Blood transfusions are of great value.
8. A few cases will inevitably develop a chronic form.
9. Exercise for lung expansion is of great importance.



# OBSTRUCTIVE LESIONS INVOLVING THE VESICAL OUTLET

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THE subject of obstructive uropathy is intimately linked with problems involved in the field of internal medicine, making it one of paramount importance not only to the urologist but more particularly to the internist. The clinical significance of this problem has been and still is considerably overlooked by the average practitioner. For this reason, it is believed that a brief résumé of the more common conditions encountered by the urologist might stimulate interest in this very important subject.

Obstructive lesions of the urogenital tract are conveniently divided into two groups, supravescical and infravescical. Discussion will be confined to the latter group and especially to those lesions occurring in the immediate region of the vesical outlet.

## TYPES OF LESIONS

1. Hypertrophy of the prostate.
2. Median bars and contractures of the vesical neck.
3. Trigonal hypertrophies and Mercier's bars.
4. Congenital lesions about the vesical orifice.
5. Neoplasms, stones, and foreign bodies in the prostatic urethra.
6. Spasms of external vesical sphincter.
7. Bladder neoplasms and diverticula obstructing the vesical outlet.
8. Retroperitoneal tumors.

## PATHOGENESIS

For a clear understanding of the pathogenesis it is necessary to regard the urinary apparatus as a single tubular system with the bladder suspended between the renal cortex and the meatus urinarius. Accepting this conception of the urinary system, it is

easy to understand why an infravescical obstruction, whether in an old man, due to an hypertrophied prostate or in a child, due to a vesical neck contracture, directs strain first upon the bladder. This organ, like the heart, responds to the increased work by undergoing hypertrophy. In fact the brunt of the attack being first thrown upon the bladder, leaves the kidneys entirely unaffected. Should the obstructive lesion be permitted to continue, however, the resistance to the free flow of urine from the bladder increases to such a degree that its compensatory mechanism soon fails and the assault is promptly transmitted to the ureters, and thence to the kidneys, the final outcome being decompensation and dilatation with resultant hydronephrosis. Whether the hydronephrotic changes will be unilateral or bilateral will depend upon the type of obstruction; an infravescical obstruction leading to bilateral changes, a supravescical one to unilateral hydronephrosis.

To make a diagnosis of hydronephrosis or pyonephrosis, and to direct treatment toward such conditions before ascertaining the causative agent, is to commit a grave and often fatal blunder. The diagnosis of hydronephrosis makes it incumbent upon the clinician to locate the obstruction. It is of even greater importance to know that a patient with an obstructive uropathy, if subjected to a careful examination, will invariably show unmistakable evidence of renal insufficiency long before the kidneys have become hydronephrotic. It is often impossible to differentiate by ordinary laboratory or clinical procedures the symptom-complex caused by obstructive lesions from that due to chronic nephritis or Bright's disease. A correct diagnosis

can be made only by means of a careful and thorough local examination. The reason for this is that in both conditions the symptoms, being due to impairment of the normal excretory powers of the kidneys, naturally fit into the complex called uremia. It is, of course, possible for a chronic nephritis to coexist with an obstructive urinary lesion. In this event, a differential diagnosis is made possible by establishing free urinary drainage, placing the patient under careful observation, and then ascertaining the degree of renal impairment due to the obstruction and that due to permanent structural changes within the renal parenchyma. In the purely functional disturbances caused by obstructive lesions, complete restitution to normal will invariably follow the removal of the obstruction, providing of course that no permanent structural alterations within the parenchyma have occurred. When such changes do occur they are due to infection or to hydronephrosis, resulting from back pressure. To avoid error, therefore, one could with great advantage follow the rule of eliminating the possibility of obstruction in all cases presenting the clinical picture of uremia. This rule holds good especially in men past forty-five years of age.

**Symptoms.** Uremia is too well known to warrant a detailed description of its symptomatology. A brief résumé of its chief characteristics might aid in recalling the picture. It is not necessary for one to behold an elderly man with dry tongue, foul breath, thirst, anorexia, headache and possibly dyspnea; nor to see a drowsy individual with edema of the legs who is hiccupping or vomiting, and suffering from bloody diarrhea to make the diagnosis of uremia. A combination of only a few of these symptoms should be sufficient to arouse suspicions of some degree of renal impairment.

Should the patient be a man past middle age it becomes incumbent upon the physician to decide whether or not he is dealing with a case of renal insufficiency due to

an obstructing lesion. This is especially true when the man in addition to giving systemic symptoms indicative of uremia also complains of increased frequency of urination, with hesitancy and stoppage of the stream. How very simple it is to have the patient void and then to introduce a catheter into the bladder and determine the amount of residuum. The finding of residual urine is conclusive evidence in itself of a failure in compensation of the vesical mechanism, due always to a lesion at or below the vesical outlet. It is a procedure that can be carried out by any physician in the office or at the bedside without the slightest trouble. The next step is to determine the character of the obstruction, which can often be accomplished by a simple rectal examination, especially when the cause is an enlarged prostate. It is indeed difficult to understand why a rectal examination is often left for the consultant, when it should constitute as important a step in the physical examination as the examination of the pupillary reflex or the auscultation of the heart.

Assuming that rectal examination reveals no enlargement of the prostate, then cystoscopy is called for to determine the exact nature of the obstruction. A simple observation cystoscopy is all that is necessary to clinch the diagnosis. In the first place, the finding of trabeculations in the bladder with or without cellules indicates peripheral resistance. It means that the bladder musculature has hypertrophied as a result of increased effort to overcome the added resistance to the free flow of urine. For anyone familiar with the interpretation of cystoscopic pictures it is an easy matter to detect a tumor, a stone, an obstructing prostate, or the mouth of a diverticulum, thereby determining the true nature of the obstructing lesion.

Laboratory methods have become so simplified, especially in the field of urology, that no physician is justified in omitting them in cases of nephritis. The phenol-sulphonphthalein renal function test, so

simple in its execution, if it were employed in all cases of suspected uremia would eliminate many errors in diagnosis. A blood chemistry determination today is to be had in every city, town or hamlet possessing a hospital or laboratory; and certainly it is within the capabilities of any physician to do a careful urinalysis and urea determination. If the above examinations were routinely employed when examining a suspect, it would become a relatively easy matter to determine whether the patient is suffering from some type of renal impairment.

After establishing this fact, it becomes necessary to determine whether the renal insufficiency is due to parenchymatous changes within the kidney or to an obstructive lesion somewhere in the lower urinary tract. The important triad of symptoms—pain, hematuria and tumor—is sufficient to bring to mind the picture of hydronephrosis. A rapid and continuous dripping of clear urine of diminished 'phthalein concentration through a catheter introduced into the kidney, is additional evidence of dilatation of the renal pelvis. For refinement in diagnosis pyelography may be resorted to. Should the pyelogram present clubbing of the minor calyces with or without dilatation of the pelvis, the diagnosis of hydronephrosis is clinched, since these findings are absolutely pathognomonic of the condition.

#### DIFFERENTIAL DIAGNOSIS

*Hypertrophy of the Prostate.* Enlargement of the prostate, most frequently due to adenomata within the gland, is of itself of little importance. It is only when the gland encroaches upon and compromises the lumen of the urethra or vesical outlet, that it assumes grave significance, because of its detrimental effect upon the kidneys. In other words, the obstruction results from the intrusion of the enlarged lateral lobes into the prostatic urethra or from the valve-like action of an enlarged middle lobe upon the vesical outlet. The advanced age of the patient, the history of increasing

hesitancy, frequency, nocturia and possibly dribbling, associated with the typical cystoscopic picture, suffice to make the diagnosis simple. The finding of an enlarged prostate by rectal examination is corroborative evidence. Its absence, however, does not militate against the diagnosis of hypertrophy of the prostate since the enlargement can be entirely confined to the bladder and urethra.

*Median Bars and Contractures.* These lesions, while not as frequent as prostatic



FIG. 1. Pear-shaped calculus lying in the mouth of the vesical outlet causing obstruction.

hypertrophies, are yet sufficiently often encountered and so often overlooked that they constitute important entities in urological diagnosis. The median bar is a ridge-like thickening of the floor of the internal sphincter. The contracture is a similar thickening involving the entire sphincter. Both of these conditions are stages in one process, namely a chronic inflammatory lesion usually originating in the prostate and secondarily invading the entire internal sphincter and prostatic urethra.

Unlike hypertrophied prostates these lesions are usually seen in younger men.

The symptoms, however, very closely mimic those due to enlarged prostates. A correct diagnosis is made by the cystoscope. Instead of lateral prostatic lobes intruding into the urethra or the lid-like middle lobe projecting over the floor of the sphincter, one sees a ridge-like elevation extending from the floor of the sphincter and a recession of the supramontane urethra. In the fully developed contracture cases the vice-like grip upon the cystoscope is diagnostic.

There are two types of alterations in the trigone capable of giving obstructive symptoms. Mercier's bar and the undermined trigone. Mercier's bar is a thickening of the interureteric line which appears through the cystoscope as a thickened ridge extending between the two ureteral orifices. The undermined trigone or, as it is also called, the dissected type of trigone, appears as an oblique plane lying on the floor of the bladder with a well-developed pouch of bladder behind it. Both types can give



FIG. 2. Cystogram, showing an enormous dilatation of bladder in a boy twelve years of age with contracture of the vesical outlet. Patient referred for treatment for nocturnal enuresis.

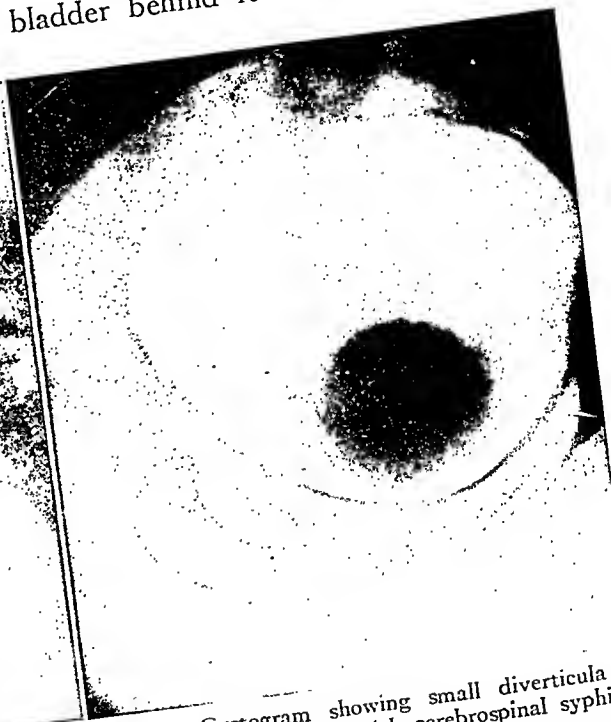


FIG. 3. Cystogram showing small diverticula and cellules in a woman with cerebrospinal syphilis.

*Trigonal Hypertrophy and Mercier's Bars.* These conditions have been fully and beautifully described by Young, Hinman and others. The trigone is nothing more than a fan-shaped muscle which can properly be considered as an extension from the ureteral musculature, extending over the floor of the internal sphincter of the bladder, and attached to a point just above the apex of the verumontanum. The various pathological forms which the trigone can assume are always dependent upon lesions in the ureters or urethra.

rise to definite and marked obstruction about the vesical outlet, with symptoms no different from those caused by an enlarged prostate or a median bar. The cystoscope alone makes the diagnosis. *Congenital Lesions about the Vesical Orifice.* In discussing the congenital types of obstructive lesions about the vesical outlet, it is to be noted that a great diversity of opinion exists among various observers regarding the nature of the lesions. Beer, for example, maintains that the most frequent type of obstruction encountered in children is contracture of the outlet due, as he believes, to a dysfunction between

the detrusor muscle and the internal sphincter. As a result of this there occurs a spasm of the outlet followed by fibrosis. Bugbee, on the other hand, is of the opinion that hypertrophy of the verumontanum and valves in the prostatic urethra frequently cause obstruction. Whatever the nature of the obstruction may be, the outstanding features are the presence of a distended bladder and the finding of a large amount of residuum following micturition. Cystoscopy readily discloses the true nature of the obstruction. The difficulty encountered here is to convince the physician that cystoscopy in infants and children is at times as much indicated to make a diagnosis as it is in adults. To omit the use of this diagnostic aid in children is to deprive them of an indispensable and often the sole means of making a correct diagnosis. It is, indeed, unfortunate to permit children to reach the stage of hydronephrosis before recognizing the obstructive lesion responsible for it.

*Tumors, Stones and Foreign Bodies in the Prostatic Urethra.* This subject requires but a passing remark since its relation to the topic of discussion is so obvious. A combination of cystoscopy and roentgenography makes the diagnosis of these lesions quite simple.

*Spasms of the External Sphincter.* The neurologist will readily attest to the frequency of obstructive lesions in the urogenital tract due to lesions in the brain or spinal cord. To understand this problem it might be worth a few moments to recall the factors involved in the physiology of micturition. Unlike the anal sphincter the internal vesical sphincter cannot be considered a true sphincter in the sense that it consists of a circular band of muscle fibers. In fact, the neck of the bladder, when closed, forms a semicircular slit with its convex portion formed by the confluence of the trigonal muscle as it passes through to its attachment near the verumontanum. Although the internal and external sphincters, the trigonal muscle, and the detrusor vesical or, as it is frequently designated, the true muscle of the bladder, are all actively

concerned in the act of micturition, yet the exact correlation between them is not at all clearly understood. Macht maintains that the trigonal muscle has an innervation different from that of the internal sphincter or of the detrusor vesicæ, being by the true sympathetic fibers from the third and fourth lumbar segments by way of the vesical plexus. The detrusor, however, receives its innervation by the parasympathetic fibers through the nervus erigens from the second and third sacral segments. The voluntary elements in the nervous mechanism of micturition pass by the pudic nerve to the urethral muscle. Difficulty in the expulsion of urine may be due to a diminution in the muscular power of the bladder, or to an increase in the tonus of the sphincter muscle or to a combination of both of these factors. The exact nature of the neurological lesion responsible for the disturbance in the mechanism, whether it be a tabetic lesion or a tumor or area of softening in the brain or cord, can be left to the neurologist to determine. An examination of the pupillary reflex, the knee-jerks, the elicitation of abnormal reflexes such as Babinski, will frequently put the examiner on the track of the disturbance. The finding of a spinabifida through a roentgenogram of the lumbosacral spine is not at all uncommon in neurological disorders of the urinary tract.

Paradoxical incontinence manifested by constant dribbling of urine as a result of overflow is the only symptom referable to the urinary apparatus that is characteristic of the neurological bladder. This is, of course, a late symptom. Otherwise the symptoms in this condition are practically identical with those due to fibrosis colli. The cystourethroscopic picture is, however, quite different. In the first place the instrument on passing the cut-off muscle slides into the bladder without the slightest effort. The vise-like muscle grip upon the instrument seen in contracture cases is entirely absent. The typical collar intrusion into the vesical lumen is also absent. However, it is only by a complete and careful routine physical examination that a



correct differential diagnosis can be made between the two types of lesions.

*Bladder Neoplasms, and Diverticula obstructing the Vesical Outlet.* For a bladder tumor or a diverticulum to obstruct the outlet of the bladder it must be situated close enough to the vesical neck to compromise its lumen. The pedunculated tumor is much more apt to do it than is the tumor with broad base. As for diverticula, they are usually of the dissecting variety, burrowing their way behind the bladder, until they occupy a position between the rectum and the lowermost part of the bladder. A history of painless hematuria followed by symptoms of obstruction to the free flow of urine call for a careful cystoscopic examination. At times it is exceedingly difficult, even with the use of the ordinary cystoscope, to detect a vesical neck tumor especially if situated on the anterior lip of the sphincter. With the Young retrograde cystoscope the difficulty is readily overcome.

In cases of dissecting diverticula the history is usually elicited of fractional emptying of the bladder along with other symptoms suggestive of obstruction. At times it may be possible by rectal examination to detect a soft boggy mass lying above the upper border of the prostate. The cystogram, especially when made with a lateral exposure, clinches the diagnosis.

*Retroperitoneal Tumors.* These tumors can offer considerable difficulty in diagnosis. Suspicion of their existence is usually aroused upon finding a pelvic mass that persists after emptying the bladder, and a negative bladder cystoscopically. Retroperitoneal tumors as a rule cause more rectal symptoms and venous stasis in the lower extremities than do extravescical lesions. A tentative diagnosis may be ventured through the process of elimination and verified at exploration.

#### TREATMENT

The principal aims in the treatment of the obstructive uropathies are twofold, namely, to remove the obstruction and to restore the urinary organs to as near normal as possible. The kidneys are at

times so badly damaged that the operative removal of the obstruction becomes not only dangerous but impossible. The subject of therapy is entirely too vast to come within the scope of this paper. It might be profitable, however, to touch upon the broad principles involved in the general treatment of patients suffering from obstructive lesions of the lower urinary tract. The greatest problem in therapy is the rehabilitation of the patient so that he may be made fit for the major operation. This is best accomplished by the process of gradual decompression of the bladder accompanied by active urinary secretion, best induced by encouraging the patient to take large quantities of water by mouth, if possible, or, if vomiting is present, by rectum, hypodermoclysis, or intravenously. Operation is performed only after the surgeon has convinced himself by repeated 'phthalein and blood urea determinations that the renal function has become stabilized. In other words, the treatment directed to the bladder is secondary to that given the kidneys, so that by the time the indwelling catheter or the suprapubic tube has restored the kidney function to optimum the bladder will usually have regained its tone. The actual technique of removing the obstruction is relatively simple, once the patient's condition is improved to a point where he can be made to stand operative intervention.

#### CONCLUSION

There is no field in surgery where more gratifying results can be obtained than in urology. And the finest results of all are those obtained on patients with obstructive nephropathies, providing, of course, that they are brought for treatment before permanent impairment of the kidneys has occurred. Finally, it may be stated that the clinician who undertakes to treat one of these unfortunates actually holds the life of that patient in his hands. A good diagnosis and properly instituted therapy, and the patient lives; the reverse, and the patient dies or is condemned to a life of permanent invalidism.

# DANGEROUS TENDENCIES IN IODINE THERAPY

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SINCE iodine as a preventive of goiter has been widely advocated by public health authorities and advertised by commercial houses, the physician rarely sees a patient with goiter who has not at some time taken iodine in one form or another. The administration may have been under the supervision of a physician, but more often the patient has treated himself on the advice of a friend or as a result of "educational" advertising. Now that there seems to be an increase in goiter in the Northeast, we are presented with more and more patients who are in a dangerous condition from the injudicious use of the drug.

With every good thing that comes out in medicine we have the concomitant bad feature; charlatans, commercial drug firms, and newspapers making stock of the new discovery and eager to make profit from a real boon to mankind. In the denser portions of the Midwestern goiter belt the quack has had a firmer hold than in the East, but one is led to believe that the laity in that region is now awakening to the dangers of self-treatment. Jackson reports 50 cases of what he chooses to call "iodine hyperthyroidism." As many cases as this in the territory from which he draws his work is proof positive not only of the gullibility of the public but of the uncertain knowledge of the average physician who attempts to treat goiter with iodine. In 28 of his cases iodine toxemia followed treatment by the family physician.

A quack remedy that the patient has taken over a fairly long period of time, however, accounts for most of the dangerous and uncontrollable cases. My idea in presenting this paper is to sound a warning against the spread of this form of quackery in the eastern portion of the so-called

goiter belt. Although the charlatan is usually the patent medicine man, he is not the only quack. To place the makers of iodized food stuffs in the same category does not seem too severe, even though they are there unwittingly. Big business clutches at anything that will increase sales. Recently I had occasion to advise against the iodizing of a well-known brand of peanut butter. Already we are putting iodine in water and salt, and unless manufacturers are watched we will be getting doses in all sorts of canned and bottled goods. Thus far, the amount of iodine we receive from other than natural sources is probably so infinitesimal that no harm is done; whether or not it is truly beneficial as a prophylactic will be determined only a good many years hence after careful study of the situation.

At present we should institute propaganda for the control of this potential danger. So far as self-treatment by the laity is concerned I believe that well-directed publicity by health authorities would soon scotch the evil. This is especially possible in the East where health publicity is well organized and the public is accustomed to newspaper articles by health authorities.

Public education in the dangers of iodine therapy is not enough. The treatment of goiter is a much more subtle and delicate matter than most of us have realized, and the physician must give time to a study of diagnosis and methods of treatment. Unfortunately, a certain fearlessness of iodine has developed following Plummer's report on its use in exophthalmic goiter and the general knowledge we have of its use as a prophylactic in Switzerland, Italy, and our own states where goiter is most prevalent. We are bombarded with pamphlets from pharmaceutical houses, and patients of all

## Wetherell—Iodine Therapy

ages and with all types of goiter come to the physician demanding to be cured with iodine.

If the patient has an exophthalmic goiter, he has sometimes received a series of treatments with the usual well-known recurrence of symptoms. How difficult this type of case is to deal with every surgeon who does any amount of thyroid surgery well knows. He also knows the brilliant results obtained when Lugol's solution is properly employed preparatory to operation to reduce the basal metabolic rate or control a crisis, and after operation to combat postoperative hyperthyroidism.

Although the continued administration of iodine in exophthalmic goiter is futile and dangerous, it is the adenomatous type of goiter that is peculiarly susceptible to the misuse of the drug. A certain amount of hyperplasia in toxic adenoma probably accounts for much of the symptom complex of this condition. It is probably because of this hyperplasia that iodine is so often effective in this condition and produces a temporary but deluding benefit.

Although it may appear dogmatic to prohibit the use of iodine in goiters after the age of twenty-one, I am convinced that it is a sound policy for the general practitioner to follow. While there may be possible exceptions to this rule, adherence to it will go a long way toward the control of the misuse of iodine. Patients have an uncanny faculty of finding out what they are taking and broadcasting their little knowledge. If adenomas have not developed before the age of twenty-one, the size of a colloid goiter may be controlled or reduced by the judicious use of iodine. Yet, as Arn has pointed out, this is not always true. Some simple colloid goiters fail to respond to treatment. The simple administration of iodine alone is often not efficacious because the child continues under a nervous or physical strain from overactivity in school work, too much excitement at home, and numerous other causes. This nervous tension throws an extra burden on an already overtaxed gland. The activities of most children with goiter should be restricted so that they will lead quiet lives,

as much of the time as possible devoid of undue stimulation.

In many cases adenomas have developed before the age of twenty-one, and in these iodine is very likely to produce toxic symptoms. In these cases a cure with iodine cannot possibly be expected, but if the patient is carefully watched while under treatment it is possible to retard the growth of the adenoma. At the first sign of toxic symptoms the iodine should be stopped, and one should be careful that the gratification of seeing the gland reduced in size does not blind one to the development of toxemia. Hyperthyroidism seldom develops in adenomatous goiters in children except through the misuse of iodine.

For this reason particularly, I believe that the administration of iodine to children of school age should be absolutely under the control of a physician who understands the problem. As prophylaxis means *prevention*, the prescribing of iodine is no longer within the province of the public health physician once a goiter has developed. The administration of iodine is then treatment, and the child should be referred to a competent physician chosen by its parents.

The administration of iodine in prophylactic doses to school children has in many instances been the cause of parents and older members of the family taking some of the drug at home, without supervision. Health officials, therefore, need to go a step further in their work. By that we mean that they should inform the family that what is good for the child may be harmful if taken by adult members.

## SUMMARY

1. Immediate steps should be taken by health authorities to warn the public of the dangers of self-administration of iodine.
2. Before using iodine in goiter, physicians should acquaint themselves with the indications as brought out in many contributions by leading authorities.
3. Health agencies should limit themselves to prophylaxis and leave the treatment of existing goiters to the personal supervision of a private physician.

# THYROTOXICOSIS AND ASSOCIATED VAGOTONIC AND SYMPATHICOTONIC SYNDROMES\*

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## INTRODUCTION

SINCE the symptomatology of a toxic thyroid is so closely linked to the sympathetic nervous system it would appear that the line of cleavage between vagotonia and sympathicotonia drawn by Eppinger and Hess would have an intensely practical value.

Lack of uniformity, however, in designation of these two divisions of the autonomic system has added to a confusion already existing based on an anatomical separation difficulty. It is relatively easy to make an anatomical division of these two groups at the center, or even in the vicinity of the cerebrospinal axis, but the intricate peripheral network makes it an all but impossible task at the points where effects on function may be observed.

Langley's pronouncement is, probably, as workable as any other. According to him the autonomic system embraces the entire sympathetic nervous system and is divided into:

(a) The sympathetic autonomic, including certain fibers of the vagus nerve

(b) The vagal autonomic

Under the first grouping are placed all the nerves that pass through the gangliated cord, and in the second, the remaining vegetative fibers or expanded vagus.

The gangliated cord referred to, also called the trunk, passes parallel to, and in front of, the vertebral column and presents a corresponding ganglion for each vertebral segment.

The autonomic system is also called the vegetative nervous system and may be visualized as an outgrowth of the cerebrospinal system.

This nomenclature would seem simple and sufficient, but the perplexity lies in a manifest lack of agreement in designating the same thing by the same name. For example, Pottenger uses the terms "vegetative" and "autonomic" synonymously, but speaks of the two divisions as "sympathetic and parasympathetic." Other authors call the extended vagal division the autonomic system and yet others refer to it as the vagus system, thus making confusion worse confounded. Some other authors classify the sympathetic autonomic division as the thoracico-lumbar and the vagal autonomic division as the cranio-sacral division. Still others would classify the vegetative system according to the function of the nerve fibers; hence, vaso-viscero-glandulomotor accelerator division and the vaso-viscero-glandulo-motor inhibitory fibers. This designation fails to clarify the situation since nerves from both the sympathetic autonomous and the vagal autonomous divisions possess positive and negative effects on muscles.

The nomenclature of this part of the nervous system is as unsettled as that pertaining to the thyroid, the classification of which is yet in a bewildering state of flux.

The vegetative system may be divided anatomically into two units. One is composed of fibers originating in the middle portion of the thoracic and the upper lumbar cord which pass through the gangliated cord after which many become mixed with other fibers and their identification where they terminate as end organs becomes difficult or impossible. The fibers of the other unit have their origin in the

\* Read by title at the Annual Meeting of the American Association for the Study of Goiter, Philadelphia, February 1, 1927.

brain, the medulla and the sacral segment of the cord and do not have a relation to the ganglionated cord.

In contrast with this Babel of terms of anatomical structures the physiological facts are more uniformly agreed upon. All agree that the vegetative organs have a dual nerve supply which is antagonistic. It is further agreed that this double innervation of these organs not under the control of the will is of tremendous importance. This mutually antagonistic arrangement maintains a balance in function which is indispensably protective. The inhibitory influences are, indeed, anything but superfluous when one considers the normal state of irritability of the ganglionic cells. This irritability could be geared to normal needs and normal stimuli but the lack of a check when subjected to abnormal stimuli as in functional or organic changes would lead to results highly dangerous, even fatal. The effect of a febrile process on the heart rate were there no antagonistic agency is an example of easy understanding.

If the physiological process were as simple as appears on casual study, doctors would have more time for music or golf. But the influence of endocrines seems ubiquitous. The secretions of these glands exert a powerful effect on the mechanism of body metabolism and the extent to which this effect is accomplished through their action on the vegetative nervous system, is at once an interesting and largely unsolved problem. The action, so far as known, of the endocrine secretions on metabolism would seem to justify grouping them into those (a) activating, and those (b) inhibiting it. In the first group may be placed the thyroid, suprarenal and pituitary glands while in the second group would be found the thymus, pancreas and parathyroid glands. This relationship to metabolism covers proteins, fats, carbohydrates and mineral substances. The hypoglycemia of hypothyroidism, dyspituitarism and Addison's disease is common knowledge. The relationship between

calcium deficiency and parathyroid loss is also well established, while that between endocrine dysfunction and muscular dystrophies exists but is less well known.

Whenever the balance between the sympathetic and vagal autonomic divisions which exists normally is disturbed one or the other obtains the ascendancy. If it be the vagal, then the group of conditions consequential thereto is termed vagatonia; if it is the sympathetic it is termed sympathicotonia. Between these two groups, numerous mixed, even transition forms may be encountered which muddy the clinical waters. Certain of the endocrine hormones act through the vagal division alone while others act through the sympathetic and yet others act through both. The adrenals are active, powerful sympathicotonic agents while the pancreas exercises an equally selective effect on the vagal division. Thyroid secretion expresses itself through both, hence, the hypothyroid patient is not purely vagatonic nor is the hyperthyroid victim purely sympathicotonic.

#### VAGATONIA

Viewed clinically, vagatonia appears to be a chronic state of vagal excitability and the organs supplied by this system will be found to be in a state of irritability. Recalling the structures receiving their nerve supply through the vagal system, the symptoms of vagatonia become a matter of multiplied physiological action. Through it the gastric and pancreatic secretions are increased, peristalsis reinforced, the heart slowed, Zinn's zone relaxed and the pupil contracted.

One might hesitate to accept the announcement of Eppinger and Hess that a patient having a vagatonic syndrome has, therefore, constitutional inferiority, but that it may occur in individuals with an inferior constitutional make-up is admitted; that an unstable nervous equilibrium constitutes a background for hyperacidity with pylorospasm is believed and that this latter condition is often an ante-

cedent clinical phase to peptic ulcer, the writer has come to chronicle in his records. In other words, many cases can be definitely grouped as vagatonias and many as sympathicotonia and the recognition of mixed and transitional groups need in no wise lessen the value of such clinical grouping. The group having a vagatonic bias represents the young adult period and middle age and often loses it entirely as old age is encompassed. In its relation to thyroid secretion one cannot escape the perplexing knowledge that this gland is more active during the reproductive period of life with a tendency to hypothyroidism with the age of the "lean and slippered pantaloons." It can partly be explained by the assumption that thyroid hormone affects both the vagal and sympathetic autonomic systems.

The following grouping of the symptoms of vagatonia is not original except as to the order of arrangement.

- (a) Eye
  - Narrow palpebral fissure
  - Blepharospasm
  - Infrequent winking
  - Enophthalmos
  - Epiphora
  - Accommodation spasm
  - Myosis
- (b) Skin
  - Hyperhydrosis
  - Acrocyanosis
  - Dermatographia
  - Acne
  - Hyperresponsiveness to pilocarpine
- (c) Respiratory System
  - Irregular respiration
  - Bronchial asthma
  - Laryngospasm
  - Husky voice
- (d) Circulatory System
  - Arrhythmia
  - Bradycardia
  - Eosinophilia
  - Pseudoanginal attacks
  - Erythromelalgia
- (e) Digestive System
  - Diminished gag reflex
  - Increased salivary flow
  - Esophagismus
  - Cardiospasm
  - Hyperchlorhydria
  - Pylorospasm
  - Gastric hypertonia
  - Reflex vomiting
  - Mucous colitis

- Tender colon
- Spasm of sigmoid
- Constipation
- Visceroptosis
- Visceral crises
- Acrophagia
- (f) Nervous System
  - Insomnia
  - Mental irritability
  - Sexual hyperexcitability
  - Nervous chills
  - Easy fatigue
  - Lack of confidence
- (g) Metabolism
  - Increased sugar tolerance
  - Increased fat tolerance
  - Status thymolymphaticus

#### SYMPATHICOTONIA

Sympathicotonia is practically a normal condition in females and though occurring in a fairly large percentage of males it should be looked upon in men as a stigma of feminism. Its anatomical as well as physiological anomalies occur chiefly in the nervous cardiovascular system. Neuropaths and psychopaths are common in this group, likewise neurasthenia finds plentiful recruits in these unstable nervous individuals.

In grouping the phenomena of sympathicotonia it is of advantage to arrange them after the scheme followed in setting down those of the vagatonic group.

- (a) Eye
  - Mydriasis
  - Myosis on forced inspiration
  - Myosis on forced expiration
  - Wide palpebral fissure
  - Diminished lachrymal secretion
  - Winking reflex diminished
  - Prominence of eyeball
  - Faulty convergence
  - Loewe test negative
- (b) Skin
  - Urticaria
  - Angioneurotic edema
  - Facial pallor on emotion
  - Hypohydrosis
  - Cutis anserina
  - Pigmentary anomalies
  - Cavities, unilateral or bilateral
  - Psychic flushing
  - Salivation not increased by pilocarpine
- (c) Respiratory System
  - Dyspnea
  - Tachypnea
- (d) Circulatory System
  - Preordial distress
  - Palpitation

Exaggerated amplitude of cardiac contractions  
 Apical impurity after fatiguing exercise  
 Pulsation of superficial vessels  
 Capillary pulsation  
 Tachycardia, orthostatic  
 Vasomotor lability  
 Respiratory arrhythmia  
 Aschner's phenomenon  
 Goetsch's test

(e) Digestive System  
 Intestinal colic  
 Nervous diarrhea  
 Hypochlorhydria  
 Gastric atony  
 Lessened secretions of gastrointestinal tract  
 Diminished salivary secretion  
 Lessened peristalsis of intestine  
 Hypertonicity of intestinal sphincter  
 Painless dysphagia  
 Gag reflex, increased

(f) Nervous System  
 Neuroses  
 Psychoses  
 Emotional polyuria  
 Pollakiuria  
 Exaggerated emotivity

(g) Metabolism  
 Low sugar tolerance  
 Alimentary glycosuria

### CLINICAL APPLICATION

While the manifestations attributable to either the vagatonic or sympathicotonic group may be kept in mind during the clinical study of a case and set down in a record of physical findings, yet they will be disconnected. The writer has found it convenient to keep them grouped in order to make a visual inventory helpful to an intelligent summary at the close of the study. A sheet tabulating the more important features of the two conditions is made a part of the record as is the laboratory sheet or a graphic temperature sheet; on this is noted the result opposite each phenomenon. Thus at a glance the clinical picture may be reviewed at any subsequent study of the case. The words *present* or *absent*, *positive* or *negative*, or the signs *plus* or *minus* may be selected for noting the findings as the clinician may desire. The writer uses the signs *plus* and *minus* as the degree of the existing phenomenon may be indicated by +, ++, +++ and so on similar to recording a Wassermann reaction. Chart No. 1 is taken at random from the records of cases so studied and shows a

preponderance of vagatonic symptoms. The fact that some were negative makes the conclusions no less definite.

CHART No. 1  
 HYPERPLASIA OF THYROID WITH TOXIC SYMPTOMS.  
 BASAL RATE WAS PLUS 19 PER CENT, MALE, WHITE,  
 AGED TWENTY-NINE YEARS

Vagatonica	Phenomena	Reaction
	Myosis.....	+
	Narrow palpebral fissure.....	+
	Hyperhidrosis.....	+
	Achrocyanosis.....	+
	Dermatographia.....	+
	Acne.....	-
	Pilocarpine hyperresponsiveness.....	-
	Bradycardia.....	+
	Erythromelalgia.....	-
	Gag reflex diminished.....	+
	Cardiospasm.....	+
	Pylorospasm.....	-
	Hyperchlorhydria.....	-
	Reflex vomiting.....	+
	Mucous colitis.....	-
	Spastic sigmoid.....	+
	Visceroptosis.....	+
	Aerophagia.....	-
	Mental irritability.....	-
	Increased sugar tolerance.....	-

Chart No. 2 shows a preponderance of sympathicotonic symptoms.

CHART No. 2  
 COLLOID GOITER WITH ADENOMATA, TOXIC. BASAL  
 RATE WAS PLUS 62 PER CENT, FEMALE, WHITE,  
 AGED TWENTY-EIGHT YEARS

Sympathicotonia	Phenomena	Reaction
	Mydriasis.....	++
	Winking reflex infrequent.....	+
	Wide palpebral fissure.....	+
	Conjunctiva dryness.....	-
	Convergence faulty.....	+
	Loewe test.....	-
	Urticaria.....	+
	Hypohydrosis.....	-
	Cutis anserina.....	+
	Psychic flushing.....	-
	Tachypnea.....	+++
	Palpitation.....	++
	Heart hurry.....	+
	Aschner phenomenon.....	+
	Goetsch test.....	+
	Hypochlorhydria.....	-
	Salivary response to pilocarpine.....	+
	Gag reflex increased.....	-
	Psychoses.....	+
	Low sugar tolerance.....	-
	Glycosuria.....	-

These two charts are sufficient to indicate the truth of what has already been



said that when the equilibrium of the two autonomic divisions is disturbed one or the other usually obtains ascendancy. The difficulty lies in an inability to predetermine which will prove the dominant phenomena in a given patient when the thyroid toxicity does develop. In other words, in the writer's experience both groups of phenomena occur in thyrotoxicosis, but it should also be stated the sympathicotonic has been found in the larger per cent of his group of cases. This has been true only so far as predominance of phenomena is concerned, however, as such symptoms as dermatographia, gastric retention, hyperchlorhydria, pylorospasm and a spastic sigmoid have occurred in a majority of the cases. On the other hand, mydriasis, wide palpebral fissure, psychic flushing, palpitation, tachycardia, positive Goetsch's test and vasomotor lability have occurred in the larger per cent of the group. This overlapping of the two groups introduces the mixed or transition group which deprives the attempt at classification of an entirely satisfactory value in a study of goiter cases.

The influence of a toxic thyroid in lowering the threshold of excitability of various organs resulting in the physiologic anarchy characteristic of hyperthyroidism may be admitted without denying the clinical value of observance of these two fundamental types.

May we then be justified in accepting the classification of vagatonic and sympathicotonic syndromes as clinical realities since it has induced a more searching study of vago-sympathetic functions? Is it an error to conclude that the conception of Eppinger and Hess has provoked a systematization of an hitherto chaotic symptomatology of functional nervous disorders? Admitting there exists a close relationship between the sympathetic nervous system and thyrotoxicosis, does it not appear there may also be a vagatonic form of toxic goiter? And finally, was Roger far wrong when he thought that "The conception of vagatonia and sym-

pathicotonia gives a scientific form to old conceptions," and that the individuals manifesting these syndromes "are subjects whose organic nervous systems suffer the rebound of disorders caused in the internal secretions?"

#### SUMMARY

Lack of uniformity in the nomenclature of the anatomical divisions of the vegetative nervous system is demonstrated.

The physiologic grouping of this system is more uniformly agreed on.

Vagal and sympathetic imbalance may be induced by the internal secretions.

The basis for the classification of vagal and sympathetic syndromes is discussed and a grouping of clinical evidences of vagatonia and sympathicotonia for diagnostic use is offered.

Charts showing vagal and sympathetic predominance in thyrotoxicosis are given.

The value of accepting vagatonic and sympathicotonic syndromes as clinical entities is considered.

#### REFERENCES

- BROWN, L. The Sympathetic Nervous System in Disease. London, Oxford Med. Pub., 1920.
- BARKER, L. F. Clinical significance of the autonomic nerves supplying the viscera and their relation to the glands of internal secretion. *Jour. Can. Med. Ass.*, 1913, iii, 643.
- BARKER, and SLADEN. Clinical analysis of some disturbances of the autonomic nervous system with comments on the so-called vagatonic and sympathicotonic states. *J. Ass. Am. Phys.*, 1912, xxvi, 371.
- CANNON, W. R. and CATTELL, McK. Studies on conditions of activity in endocrine glands. *Am. J. Physiol.*, 1916, xli, 74.
- DENNIS, W., AUB, J. C. and MINOT, A. S. Blood sugar in hyperthyroidism. *Arch. Int. Med.*, 1917, xx, 964.
- EPPINGER and HESS. Vagatonia; A Clinical Study in Vegetative Neurology. *Tr. Sect. Nerv. & Ment. Dis., A. M. A.*, 1915, xciii, 8.
- GOETSCH, E. Adrenalin, hypersensitiveness in clinical states of hyperthyroidism. *N. Y. State J. Med.*, 1918, xviii, 259.
- The Thyroid Gland and its Diseases. Endocrinology and Metabolism. N. Y., 1922, 475.
- GUTMAN, J. Vagatonia and its significance. *Arch. Diagn.*, 1913, vi, 164.
- HOWARD, C. P. Clinical syndromes due to thyroid diseases. Endocrinology and Metabolism. N. Y., 1922, p. 299.
- HOPKINS, A. H. Clinical study of vagatonia. *Arch. Int. Med.*, 1913, xii, 566.

- JANNEY, N. W. Blood sugar in thyroid and other endocrine disorders. *Arch. Int. Med.*, 1918, xxii, 160.
- KOST, L. Vagatonia. *Post-graduate*, N. Y., 1913, xxviii, 637.
- KENDALL, E. C. Thyroid hormone and its relation to metabolism. *J. Ass. Am. Phys.*, 1918, xxiii, 324.
- LAIGNEL-LAVASTINE, M. Internal secretions and the nervous system. Translated. *Nerv. & Ment. Dis.*, Monogr. Ser., N. Y., 1919, 73 pp.
- LANGLEY, J. N. The Sympathetic and other related Systems of Nerves. *Text Book of Physiology*. Schaefer, 1900.
- MEYER, H., and GOTTLIEB, R. *Pharmacology*. Trans., 1914, p. 616.
- MACINTOSH, J. W. Practical value of a knowledge of the sympathetic and autonomic nervous system. *Can. Med. Ass. J.*, 1915, v, 775.
- POTTINGER, F. M. Relations between the endocrine organs and the autonomic nervous system. *Endocrinology & Metabolism*, N. Y., D. Appleton & Co., 1922, p. 161.
- ROME, ROGERS, FAWCETT, and BEEBE. Nerve control of the thyroid gland. *Am. J. Phys.*, 1914, xxxiv, 72.
- VINCENT, S. Vagatonia: A Review. *Endocrinology*, 1917, i, 459.
- WILSON, L. B. Pathological changes in sympathetic system in goiter. *Am. J. M. Sc.*, 1916, clii, 7, 99.
- WOLSON, J. M. The normal and pathological physiology of the visceral nervous system; with especial reference to vagatony and sympathicotony; a review. *J. Am. M. Ass.*, 1914, lxii, 1535.



## [SURGICAL SUGGESTIONS]

THE free transverse abdominal incision gives a good exposure and is easily sutured; but if a hernia occurs it is apt to assume monstrous proportions; it is hard to retain and may be very hard to cure.

THE portion of the common bile duct in the wall of, and behind, the duodenum is much longer than it is generally thought to be; and one must be wary of the evidence of patency afforded by passing a sound or probe. The instrument may be thought to be in the duodenum when, in fact, it is merely pushing the duct papilla into the bowel.

# THE OPERATIVE TREATMENT OF RETROVERSION OF THE UTERUS\*

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THE tremendous development of surgical therapy made possible by anesthesia and asepsis has naturally enough been accompanied by an enthusiasm for one or another operation, which later experience modifies. A constant questioning and review of operative results is therefore necessary.

I have ventured to offer here a follow-up study of results in a controversial field of surgical therapy, retroversion of the uterus, hoping that it may be of interest both to the medical man who must advise in this common condition and to the surgeon who may be called on to operate.

That there is a difference of opinion as to the significance and indications for operative treatment of retroversion is apparent from a study of recent literature on the subject.

Bevan<sup>1</sup> of Chicago in a recent editorial stated, "Time and scientific investigations have proved beyond question that retroversion of the uterus produces no local or general symptoms of any kind, that when symptoms are present with this condition they are due to complications. These facts are now so clearly established that we must conclude without any reserve that the time has arrived when operations done on women for retroversion of the uterus, for this condition alone, are unwarranted, unnecessary and indefensible."

On the other hand, Ward<sup>2</sup> maintains strongly that mobile retroverted uteri may lead to symptoms and quotes Crossen, Polak and Graves in support of his position. He states that when the displacement is undoubtedly chronic and the cause of distress an operation is indicated for its correction. His experience at the Woman's Hospital, New York, bears out this view.

The present study is based on cases of retroversion of the uterus operated on at St. Luke's Hospital in the past eight years, the object being to examine the indications for surgical treatment. Only those cases have been included in the series in which a suspension was the sole gynecological procedure with the exception of a few in which a curettage was also done. The large majority had appendectomies and an occasional one some additional non-gynecological procedure. This reduces the number of available cases very greatly from the list filed under the heading of retroversion. It is clear, however, that if patients on whom such procedures as perineorrhaphy, trachelorrhaphy, salpingectomy or myomectomy have been done in addition are included the value of the suspension itself will be in doubt. Patients who have not been followed at least six months have been eliminated in order to give time for any psychic effect to wane. The average period of observation after operation is over a year. With one or two exceptions who have reported by letter, the patients have been examined at the hospital. The series consists of 74 cases operated upon by 12 different surgeons.

## SYMPTOMS

That retroversion of the uterus may be found in women enjoying good health is a common experience. Lynch<sup>3</sup> in a study of retrodisplacements following childbirth found that only 42 per cent presented symptoms; of these 11.5 per cent came to operation.

In this study the chief symptoms complained of were backache, pain in the lower abdomen, sometimes located in one side or the other, pain at or made worse by

\* From the Surgical Services, St. Luke's Hospital. Read before The Hospital Graduates' Club, New York City, February 24, 1927.

## Smith—Retroversion

menstruation, discharge, menstrual irregularity and bearing-down sensations, named in the order of frequency. An examination of the complaints in those whose result was considered satisfactory as opposed to those whose result was poor does not show outstanding differences. Pain associated with menstruation was, however, relatively more frequent in the successful cases.

Many patients date their symptoms to an abortion or confinement and this is a matter of much significance.

None of the symptoms are characteristic of retroversion as distinguishing it from other gynecological conditions. On the other hand, the fact that a considerable proportion of women presenting one or more such complaints with retroversion were improved following suspension, makes it logical to believe that the displacement can lead to symptoms.

## DIAGNOSIS

Since the symptoms cannot be considered characteristic, it is essential that other causes for them be carefully ruled out before attributing them to retroversion, unless the uterus is definitely tender and adherent.

The neurotic or physically inferior patient often presents herself with a retroversion and symptoms mainly gynecological but ordinarily sufficiently widespread to arouse the suspicion that the correction of a pelvic disorder will not effect a cure. Such cases are likely to be failures at the follow-up examination and do much to discredit the operation.

Backache is a common ailment in women and an orthopedic basis for it should be ruled out before associating it with displaced uterus. The backache associated with disorders of the pelvic organs is lower lumbar or sacral (Graves<sup>4</sup>).

In a few failures a study of the case points to a urinary disorder as the real trouble. Pain from this source should not be forgotten. Frequency of urination is mentioned in a number of the histories but to my

mind it is of very doubtful significance as far as retroversion is concerned.

Leucorrhea is another complaint rather frequently listed. My impression from this study is that suspension of the uterus cannot be expected to relieve this condition.

There are several cases in which the chief complaint was recurrent attacks of pain in the right lower abdomen and in which the operative findings made it evident that the real diagnosis was appendicitis. Such a mistake is not serious as the appendix should always be inspected and is ordinarily removed when the lower abdomen is opened.

Colitis may be the cause of abdominal pains which in the presence of a retroversion might be attributed to it.

Stacy<sup>5</sup> has clearly shown that in unmarried women in whom infection, pregnancy and tumor could be ruled out, dysmenorrhea occurred in but little higher percentage in those with retroversion than when the uterus is anterior. It is therefore clear that unmarried patients complaining of dysmenorrhea as the chief symptom, should be selected for operation with especial care. This series includes examples of such cases with satisfactory outcome, however.

The operations done on these patients were mainly the Gilliam or other type of round ligament suspension. There were a number of operations by the Coffey technique, and an occasional Baldy-Webster and ventral suspension. The anatomical results show a very small number of failures. One is listed as such, and two others are reported, respectively, as retroceded and drawn to one side. From an anatomical standpoint the operation can be considered satisfactory and the test of its value depends on the symptomatic benefit received.

## END-RESULTS

In going over these cases I have attempted to be conservative in estimating the outcome. There is, however, a lack of definiteness about many of them and their reports, which makes estimation of benefit difficult.

The end-results have been listed under three headings: satisfactory, improved and poor. Of these the proportions are: satisfactory 59 per cent, improved 18 per cent, poor 23 per cent.

Other recent figures follow: Ward<sup>2</sup> from the Woman's Hospital, New York, reports 561 cases with 88 per cent relieved of their clinical symptoms. Pool and Hawks<sup>6</sup> from the New York Hospital report for 1915-1920, 78 cases with 56 per cent symptomatically good and in the next five-year period, when the operative indications were more carefully drawn, 51 cases with 70 per cent symptomatically good. Hurd<sup>7</sup> in a paper recently presented before the New York Obstetrical Society analyzed 1000 operative cases from the Woman's Hospital. Of these 149 were uncomplicated, giving subjectively 80 per cent successes, 15 per cent partial successes and 5 per cent failures.

That an adherent retroversion furnishes a clearer indication for operative treatment than a non-adherent uterus is generally conceded. If the group of adherent retroversions, 17 in number, in this series is considered, the figures are somewhat better than for the whole series, namely, satisfactory 65 per cent, improved 24 per cent, poor 12 per cent.

One woman who had a miscarriage some years previously submitted to operation because of her desire for children. During the two-year period of observation she had not become pregnant. On the other hand, in several instances a pregnancy followed within a few months of the operation, one of them in a woman married one and one-half years without a previous pregnancy.

Hurd<sup>7</sup> in his paper reports about one pregnancy in every four cases operated on where sterility was a complaint. This included both complicated and uncomplicated retroversions.

One patient desirous of children was operated on for adherent retroversion because of two miscarriages. When last examined she was well advanced in pregnancy.

A number of writers give as an indication for operation relief by trial support of the uterus with a pessary. This is obviously applicable only to patients whose retroposition can be corrected bimanually. It would seem logical, however. Unfortunately, data as to this point are lacking in this series. One patient is mentioned as having worn a pessary without relief. Her operative result was poor.

As a result of this review, I feel that too many cases have been operated on and I shall be more conservative in advising suspension in retroposition. Perhaps I am influenced in this opinion because I have contributed more than my share to the symptomatic failures. On the other hand, there is sufficient evidence that operation has a place in the treatment of retroposition and should not be discarded.

It would seem that some of the disagreement concerning the question of operation hinges about the interpretation of the terms "complicated" and "uncomplicated." In this study uncomplicated retroposition has been used to indicate retroposition, adherent or nonadherent, unaccompanied by some other conditions of the genital organs requiring operative correction. However, it is a common belief that it is not the retroposition itself but rather allied subinvolution, congestion, interference with broad-ligament blood supply or adhesion formation that causes the symptoms. In this sense all symptom-producing retroversions are probably complicated. A young woman applied for treatment, complaining bitterly of lower abdominal and rectal pain and dyspareunia following a febrile confinement some months before. She had an immobile, tender, retroverted uterus. She was cured of her symptoms by suspension of the uterus. Probably few surgeons would deny that she had presented an operative indication. On the other hand, a young woman in the course of examination was found to have a retroverted movable uterus. She stated that following the birth of her child she had been treated for a year by her doctor for

## Smith—Retroversion

retroversion but had finally gone to an osteopath who had cured her of her symptoms. The most ardent advocate of suspension would have hesitated in this instance to recommend an operation. The former case was complicated in that she had a congested, adherent uterus, uncomplicated in that there was no adnexal or other genital disease. The second case was uncomplicated from every viewpoint.

## CONCLUSIONS

The indications for operation in retroposition uncomplicated by other gynecological conditions should be very carefully drawn. The neurasthenic or physically subnormal patient with an assortment of pains is an especial source of disappointment in the follow-up clinic.

Back strain, myositis and vertebral disease as causes of backache, visceroptosis and urinary infections as causes of abdominal pain should be remembered and ruled out.

Abortion and childbirth are a common starting point of symptom-producing retropositions.

Operation is most clearly indicated for adherent, tender uteri.

Repeated abortion in women with immobile retroversion is an indication for suspension.

Not too much can be hoped for from suspension in sterility although there is some evidence that it may be a factor.

The anatomical results are good.

In properly selected cases satisfactory results can be obtained.

## REFERENCES

1. BEVAN, A. D. Disasters following operations for retroposition of the uterus. *Surg. Gynec. & Obst.*, 1925, xl, 289-91.
2. WARD, G. G. The gynecology of to-morrow; with some remarks on uterine retrodisplacement. *Ohio State M. J.*, 1925, xvi, 481-486.
3. LYNCH, F. W. Retrodisplacement of the uterus following childbirth. *J. Am. M. Ass.*, 1923, lxxxi, 984-987.
4. GRAVES, W. P. *Gynecology*. Phila., W. B. Saunders Co., 1919, 463.
5. STACY, L. J. Anteversion and retroversion of the uterus; incidence and symptoms. *J. Am. M. Ass.*, 1922, lxxix, 793-794.
6. POOL, E. H. and HAWKS, E. M. Results in surgery of the uterus and adnexa. *Surg. Gynec. & Obst.*, 1925, xli, 825-833.
7. HURD, R. A. Results of operations for retroversion. *Am. J. Obst. & Gynec.*, 1927, xliii, 742.



# THE MEANING OF BACKACHE IN GYNECOLOGY

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BACKACHE is said to be one of the most frequent of all gynecologic complaints. Lynch,<sup>1</sup> analyzing a series of 1041 gynecologic cases, found that 49 per cent of the patients had lumbosacral pain and that in 76.5 per cent of instances this disturbance was due to a gynecologic condition. Graves,<sup>2</sup> in an analysis of 500 cases of retroversion, found backache a definite symptom in 76 per cent. According to Ward,<sup>3</sup> 85 per cent of cases of lumbosacral backache are of gynecologic origin and only 15 per cent are due to orthopedic causes. In my own experience, the above figures with regard to the etiologic importance of gynecologic conditions are unduly high and other factors, including sacroiliac abnormalities, urologic disturbances and toxic conditions, are entitled to equal attention; nevertheless the fact remains that backache is an important symptom in gynecologic cases.

Gynecologic diseases, particularly retrodisplacement of the uterus, were long held to be almost the sole cause of backache in women. More recently, however, careful observations have proved that orthopedic factors in the nature of deviations of the vertebral column and pelvis from the normal constitute a fairly prolific cause of sacral pain. A further factor is an increased sensibility of the vegetative nervous system, which is commonly associated with states of lowered vitality.

A woman's backache is usually located in the sacral region. In the absence of a gynecologic condition, it may be due to disease of the other pelvic viscera, abdominal disturbances, or irregularities of the bones, joints or muscles of the lower part of the back, the lower abdomen or the thighs. A faulty posture, fatigue from over-

work or unhygienic habits, and focal infection are further important etiologic factors.

## TYPES OF BACKACHE

Backache in women may be classified conveniently under three headings: 1 the pelvic type, 2 the orthopedic type and 3 backache due to focal infection.

1. *The Pelvic Type* may be subdivided into two varieties, namely, (a) backache due to physiologic congestion and (b) that due to uterine displacements. The first variety is apt to occur during the child-bearing age, especially at the time of the menstrual period. It arises from the periodic engorgement of the pelvic organs associated with this function. A temporary aggravation of habitual constipation may also be responsible for this form of backache. The second variety arises from the circulatory disturbances associated with uterine malpositions and the consequent dragging on the uterine ligaments and supports. While constantly present, it is aggravated by menstruation and may be accompanied by vesical and rectal symptoms.

2. *The Orthopedic Type.* Sacroiliac abnormalities constitute the most important causes of this type of backache. However, attention must be given to faulty postures, especially exaggerated lordosis; to fallen plantar arches associated with spinal rigidity; and to inflammatory conditions affecting the lumbar muscles or fascia. Syphilitic spondylitis may give rise to severe lumbar pain. Sacralization of the fifth lumbar vertebra, that is, an exaggerated development of its transverse process so that it resembles a part of the sacrum, is another occasional cause of persistent back pains. According to Doub,<sup>4</sup> calcification of the



## Stein--Backache

iliolumbar ligaments may cause backache in a certain number of cases. Urologic conditions must be investigated in cases of obscure backache, as many disturbances affecting the excretory apparatus are capable of giving rise to severe backache. Lumbar backache is a common result of fatigue or faulty posture; sacral discomfort, on the other hand, is usually independent of muscular or articular strain and arises most often from gynecologic affections.

### 3. Backache Due to Focal Infection.

In a small group of women, backache undoubtedly arises from focal infection. The cause of the pain in such cases is a toxic arthritis affecting the spine or sacroiliac articulation, which arises from such distant foci as the apices of the teeth, the crypts of the tonsils or the accessory nasal sinuses. Following a recent influenza epidemic, many women who had suffered from the disease in either a mild or a severe form complained of backache for months afterward. In the majority of instances, the pain was around the scapula; but in several cases I observed it in the sacral region at a site that has usually been regarded as typical of gynecologic diseases. This backache was of the rheumatic type and subsided gradually as the defensive forces of the body overcame the local infection.

### DISCUSSION OF CAUSES

Returning to the gynecologic causes of backache, it must be admitted that pelvic congestion and inflammation with traction on the uterine ligaments are a common cause of lumbosacral pain. Conditions apt to produce backache include retroversion of the uterus, prolapsus, rectocele and cystocele. A fibromyoma, by exerting pressure on the roots of the sacral nerves, may cause backache. The nerve trunks in the hollow of the sacrum are easily affected by pressure from any cause, including congestion, a displaced uterus, traction on the ligaments or a tumor. When the cause of this pressure is removed, the backache is relieved. Treatment may take the form of manual replacement of the uterus and the

use of a pessary, correction of faulty posture, local measures for the relief of congestion or surgical intervention.

Affections of the bony ring of the pelvis constitute an important cause of sacral pain in women. Accurate roentgenographic study of the vertebral column and pelvis will disclose the origin of many backaches that were formerly assumed to be of gynecologic origin. Typical cases result from injuries of the pelvic girdle by repeated pregnancies, a condition somewhat analogous to partial separation of the symphysis pubis following childbirth. On examination in such cases, a deep-seated lumbar lordosis is noted and the roentgen plates show a more or less symmetrical lowering of the sacrum between the ossa innominata with pronounced rotation of the sacrum around a transverse axis, widening of the sacral symphyses and relaxation of their attachments. The application of a strong pelvic supporting belt around the ring of the pelvis gives considerable relief.

Many cases of backache arise from orthopedic conditions affecting the pelvic bones, especially those that are associated with abnormal mobility and relaxation of the sacrum. Sometimes associated arthritis changes are demonstrable. From a clinical viewpoint, these cases are fundamentally different from those associated with sacral pains occurring around or after the climacteric; in the latter group, the condition is primarily an arthritic process of the vertebral or sacroiliac articulations. In either case, however, the increased body weight superimposed upon the joints by the advent of pregnancy or the menopause necessarily increases the severity of the backache. Tuberculosis of the sacrocoxygeal joint may or arthritis of the sacroiliac articulation cause sacral pain, which may be associated with uterine displacement and thus give rise to confusion. Localized sacral pain on crossing the legs is especially characteristic of chronic arthritic disturbances, as is also pain in the hollow of the sacrum on vaginal pressure against the synchondrosis or the rami of the ischium.

## TREATMENT

Considering the diverse conditions that may cause backache in women, no single method of treatment can be followed. Treatment must necessarily be guided by the particular cause of the backache in a given case. Responsible gynecologic conditions must be corrected, whether by reposition of a displaced uterus, local treatment for congestion or operation. Adequate exercise, especially walking in the open air with proper footwear, helps to relieve pelvic congestion. A fair number of cases of backache are due to flat feet, and in such cases correct treatment for the arches causes the backache to disappear. In cases due to orthopedic disturbances of the pelvic ring, the application of a strong supporting belt gives much relief. Symptomatic backache arising from focal infection demands the localization and removal of the offending foci as far as possible.

From what has been said it is apparent that the so-called gynecologic backache is gradually losing ground with the advent of more exact knowledge; that various abnormal conditions not associated with the pelvic viscera may cause lumbosacral pain in a definite percentage of cases; and that, in every individual case, the cause can be found only after a careful examination of the whole patient.

## SUMMARY

Gynecologic affections have been variously estimated to be the cause of lumbosacral backache in women in from 30 to 85

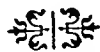
per cent of cases. Recently, however, more exact knowledge has greatly reduced the relative importance of the so-called gynecologic backache. In my own experience, the gynecologic causes of backache have been greatly overestimated.

There are three great groups of backaches occurring in women; namely, 1 the pelvic type, which may result from a physiologic congestion at the menstrual epoch or uterine malpositions and pelvic inflammation; 2 the orthopedic type, arising from such conditions as sacroiliac relaxation, faulty posture, flat feet, spondylitis, and involvement of the lumbar muscles or fascia; and 3 the focal infective type, due to distant infection in the teeth, tonsils, accessory nasal sinuses, or elsewhere.

Every case of obscure backache requires a study of the entire patient. Only when the investigation is conducted carefully from all angles may we hope to discover the particular cause in an individual case and thus be in a position to direct effective treatment.

## REFERENCES

1. LYNCH, F. W. Backache in gynecology—a study of its frequency and meaning. *California & West. Med.*, 1925, xxiii, 856.  
The frequency and meaning of backache in gynecology. *Am. J. Obst. & Gynec.*, 1926, xii, 719.
2. GRAVES, W. P. Relation of backache to gynecology. *Boston M. & S. J.*, 1923, clxxxix, 1057.
3. WARD, G. G. Backache from the standpoint of the gynecologist. *Bull. New York Acad. Med.*, 1927, iii, 238.
4. DOUB, H. P. Rôle of ligamentous calcification in lower back pain. *Am. J. Roentgenol. & Rad. Therap.* 1924, xii, 168.



# ILEOCECAL AND JEJUNOCECAL INTUSSUSCEPTION IN AN INFANT

## A CASE REPORT

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ON July 6, 1927, I was summoned to see a case in consultation with Dr. Julius Levy, a pediatricist of this city. The patient was a child of Italian birth, two years of age, whose history other than that of the present illness, was negative.

For three months the child had had cramps in the hypogastric region extending upward and downward and coming on at irregular intervals, chiefly during active play, at which time he would place his hand on his side and come crying to the mother, would go to bed, sleep for a short time, and then resume play. The mother finally brought the child to Dr. Levy and upon the second visit she announced that with the last attack the child passed a slight amount of blood. Dr. Levy found a mass in the splenic region, its direction in the line of the transverse colon. It felt doughy and, at the time, the upper abdomen was rounded from the size of the tumor. There was a tympanitic note below the mass and in the right, upper aspect of the epigastrium. He made a diagnosis

of intussusception, in which I concurred. A roentgenogram showed an obstruction at the splenic flexure.

At operation that evening the mass was found in the left upper abdominal region, and proved to be the cecum in which were invaginated the cecum upon itself, a knuckle of the ileum, and one of the jejunum. The jejunum was carefully extricated, then the ileum with its ileocecal portion, the appendix and the invaginated portion of the cecum. The appendix was inflamed, covered by dense adhesions, flattened upon the surface of the cecum, and was 7 inches long. The appendix was removed, the raw surface was peritonealized, and the cecum was rotated back to its normal site and fastened to the pelvic peritoneum by two small gut sutures. It was noted at the time that the cecum was thickened to the extent of one-fourth of an inch. The child made a perfect recovery.

I have been unable to find a case of this kind in the literature.



# SURGICAL CLINIC FROM THE HENRY FORD HOSPITAL, DETROIT

## MORBUS COXAE SENILIS\*

D. C. DURMAN, M.D.

DETROIT

THREE cases will illustrate a condition seen rather frequently in the orthopedic clinic, but not usually appreciated in the course of a general examination.

The first patient was a man aged sixty-five years, seen here in 1925. He complained of severe pain in the right hip and gave a history of having been slightly injured some time before, with development of a good deal of disability in this hip, being unable to do his work. He was fairly well preserved physically, and weighed 173 pounds and had a blood pressure of 176/96. Very little was found to be abnormal in the course of the general examination. He walked with a marked limp. There was actual shortening of  $1\frac{1}{4}$  inches on the right side. There was 25 degrees of fixed flexion deformity and about an equal amount of adduction deformity. Roentgenograms (Fig. 1) showed marked increase in the size of the head of the femur; the head of the bone was irregular in outline and much increased in density. The irregularity was more marked in the lower portion. As the down growth of bone increases in these cases, the femur is pushed upward and out of the acetabulum. This fact, together with some actual decrease in the angle of the neck and shaft of the femur, account for the shortening and adduction deformity.

The second patient was a man sixty-two years of age, who had been more or less active all his life. There was no history of previous illness. For many years he had been a stage aerobist. He stated that four years ago he began to have pain in his hip, usually worse at night; this kept him from sleeping. However, the deformity was not very marked. He had a good deal of trouble in getting around at work. During the last few years he had been in the furniture repair business and had not had to do much walking, but walking very short distances tired him extremely and produced rather severe

pain in the right thigh. He, too, was found to be fairly well preserved; weight 138 pounds; blood pressure 140/95. The rest of the examination was practically negative. He had about 70 per cent normal flexion in the hip, the limitation being most marked in abduction and rotation. There was also a hyper-lordosis of the lumbar spine and a good deal of rigidity of the spine on manipulation.

The third patient is a man aged seventy-two years, who has always been well until his present illness. He came in about a month ago complaining of severe pain and disability in the right hip. For the past two years he has not been able to work at his occupation as a farmer because of disability. The physical findings in his case are practically identical with those described in the two previous cases. He has shortening, flexion deformity, adduction of the right hip, with pain on manipulation and considerable limitation of motion in all directions. The roentgen-ray findings are also typical (Fig. 2). The head of the femur is enlarged, with much spur formation and thinning of the joint cartilages. The head is flattened. It is apparent from study of the roentgenograms alone that normal joint motion is impossible.

The gross pathology in these cases is similar to that of hypertrophic arthritis. There is fibrillation and thinning of joint cartilage, often complete disappearance of cartilage in the areas of greatest pressure not by erosion but by devitalization and attrition with the exposed underlying cortex hard and smooth as a billiard ball. The bone is of increased density at the cortex but the latter is thin, and directly beneath it the bone may be atrophic, with cyst-like areas of absorption. Joint fluid is usually subnormal in amount, the synovial membrane is infiltrated and the fibrous capsule is tough and decreased in elasticity. The essential distinction from typical hypertrophic arthritis is in

\*From the Orthopedic Department of the Henry Ford Hospital.

the relatively slightly amount of marginal lipping or spur formation and the marked total enlargement of the femoral head as well as articular surface, combined with coxa vara. In general, in this disorder, the other joints show osteoarthritic changes consistent with the age of the patient, this being practically always true with the opposite hip.

The condition represented by these three patients is known as "morbus coxae senilis" and seems to be a distinct clinical entity, and as such, deserves further consideration as to etiology. In his masterful Hugh Owen Thomas

neously, it occurs to me that the former condition might be the end-result of the latter, although in the patients we have seen in this Clinic, there is no history of any trouble with the hip early in life. It is difficult to say what the findings in the cases which Legg reported will be when they reach the age of fifty or sixty. In the discussion of Legg's paper, several cases were reported in brief in which the original diagnosis was coxa plana, but in which a question of tuberculosis existed. An exploratory operation was made for the purpose of diagnosis, and some minute cyst-like cavities were



FIG. 1. Case 1. Right hip showing mushroom appearance of the head of the femur.



FIG. 2. Case 3. Right hip, before operation.

lecture<sup>1</sup> before the Medical Institution of Liverpool in June 1925, Osgood classed this affection as a form of osteoarthritis, and I believe that most authorities also classify it as such. It nearly always occurs after the age of fifty, and there are other evidences, in patients having this disease, of a hypertrophic arthritis. The peculiar localization of the condition to one hip is a factor which has not been explained. Certain aspects of this condition lead us to believe that it may be the end-result of a longstanding process. In 1910 Legg of Boston first described a peculiar affection of the hip joint, which has been given the name of "osteochondritis deformans juvenilis," or as he is pleased to call it, "coxa plana." In a recent paper<sup>2</sup> he presented the end-results of a series of his own cases. In studying the two conditions morbus coxae senilis and coxa plana, simulta-

found, some of them containing actual pus, sterile on culture. It is possible that the condition known as morbus coxae senilis might be an end-result of pathological findings such as this.

The question as to the form of treatment for these patients depends largely on their general physical condition, age and occupation. In the very aged and feeble probably conservatism is best, and if the hip is immobilized in a light plaster spica the pain is relieved and life becomes a little more bearable. In 1921, Albee<sup>3</sup> of New York reported 128 cases of osteoarthritis of the hip-joint for which he had performed an arthrodesis. He was quite enthusiastic about his results. I believe in a later paper he pointed out that this operation was not very successful in the older patients. We know that

in osteoarthritis joint fusion is very slow and sometimes impossible to secure. The disease is a degenerative one and there is very little reason to expect bone union. Another factor which has to be considered is that most of these patients have an osteoarthritis of the spine which is also disabling and an arthrodesis of the hip increases the strain put upon the lumbar spine and consequently increases the pain and disability.

In 1922, Whitman<sup>4</sup> first reported a series of typical cases of morbus coxae senilis upon which he performed his reconstruction operation. The operation may be described in Whitman's words, as a mechanical adaptation of the hip-joint, disabled by injury or disease, to the essential requirements of locomotion. It was devised first for un-united fractures of the neck of the femur, particularly in those cases in which there was a good deal of absorption of the head. In the operation, the head of the femur is removed, and with an osteotome the great trochanter is cut across in a direction parallel with the neck of the femur. The muscular attachments to the trochanter are left intact. The neck of the femur is then reshaped so that it will fit into the acetabulum; no attempt is made to change the shape of the acetabulum itself. The trochanter is then pulled down and implanted on the outer surface of the shaft of the femur to restore the normal mechanics of the joint (Fig. 3). The leg is placed in abduction and held in this position until union is complete. Motion is then started. About a year ago, before the American Orthopedic Society, Whitman<sup>5</sup> reported another series of these cases with very pleasing results. A fairly good range of motion of the hip is secured and the patient is relieved of pain. In performing this operation for morbus coxae senilis, it is usually not necessary to completely remove the head of the femur, but merely to reshape it so that it fits into the acetabulum and will move freely in all directions.

Another operation for this condition was devised by Sir Robert Jones, but apparently has been practiced very little in this country. It consists of excising the great trochanter as in Whitman's operation, then dividing the shaft of the femur at the base of the attachment of the trochanter and fastening the trochanter to the distal end of the neck of the femur, thus making a pseudarthrosis between the outer side of the great trochanter, which has been turned under the neck of the femur, and the

upper end of the shaft. It is hard to see how a hip on which this operation had been performed could be very stable.

Still another procedure sometimes used, consists of excising the head of the femur and reshaping the neck and fitting it into the acetabulum. This procedure also gives an unstable joint and one in which there is a tendency to recurrence of the adduction deformity, but there is probably less shock with this than with the other longer operations on the hip-joint and it can be used with comparative safety in aged and feeble patients. We have performed



FIG. 3. Case 3. Right hip, after operation.

a series of Whitman reconstruction operations under spinal anesthesia in which the factor of shock has been practically negligible even in old and debilitated patients.

#### REFERENCES

1. OSGOOD, R. B. Orthopaedic aspects of chronic arthritis. *J. Bone & Joint Surg.*, 1926, viii, 1-41.
2. LEGG, A. T. End-results of coxa plana. *J. Bone & Surg.*, January, 1927, ix, 26-36.
3. ALBEE, F. H. Operative treatment (arthrodesis) for osteo-arthritis of the hip. *Am. J. Surg.*, 1921, xxxv, 296.
4. WHITMAN, R. The reconstruction operation for ununited fracture of the neck of the femur. *Surg. Gynec. & Obst.*, 1921, xxxii, 479-486.
5. WHITMAN, R. Operative treatment of arthritis deformans of the hip-joint. *Ann. Surg.*, 1925, lxxxi, 1108-1114.

# ABSCESS OF THE ORBIT\*

W. T. GARRETTSON, M.D.

DETROIT

WE have had several cases of this comparatively rare condition since this hospital opened. At present we have under observation a six-year old girl with a history of severe cold and much nasal discharge for a week or two before the onset of the present condition.

The symptoms of onset are:

1. Marked proptosis of the eyeball.
2. Impaired mobility of extrinsic muscles to which actual paralysis may be superadded.
3. Sight may not be affected, but may be reduced or entirely abolished.
4. Violent pains with very high fever—103 degrees to 106 degrees with or without cerebral symptoms such as headache, delirium, etc.

The diagnosis of orbital abscess is sometimes difficult. The following are significant:

1. Examination in the early stages of the fundus oculi may be of but little help as the disc is usually normal. Sometimes the veins show considerable engorgement, depending upon the degree of the intra-orbital pressure. If the eye is proptosed downward, this may be some aid in localization as the abscess may be in the upper part of the orbit.

2. A definite point of tenderness when pressure is made above, below, or at the inner or outer side of the eye ball. If the pain is referred above, it is probable that the abscess will be located in this region.
3. Redness of the eyelids with a little edema or ecchymosis of the conjunctiva without signs of conjunctival inflammation.
4. High fever associated with a cold and the above conditions.

Differential diagnosis must be made from cavernous sinus thrombosis as this condition is also associated with high fever, cerebral symptoms, proptosis, paralysis of the extraocular muscles and levator

palpebrae superioris. This condition is frequently associated with boils or carbuncles on the face or at the base of the nose with extension to the orbital veins, thence to the cavernous sinus. The edema and swelling in this condition is due to blocking of the venous pathway with resultant engorgement of the orbital tissues.

The point of chief distinction aside from the history of boils or carbuncles, is sudden onset of complete blindness. However, one must remember that orbital phlegmons may produce secondarily cavernous sinus thrombosis.

Etiology. 1. Injury to the orbit by a penetrating foreign body or penetrating wound.

2. Transfer of inflammation from the walls of the orbit as in sinusitis, frontal, ethmoidal and maxillary.

3. Erysipelas. Transfer from the skin to the deeper tissues through the anastomosis of the orbital with the facial veins.
4. Metastatic infection from empyema thoracis, typhus fever, scarlet fever, purulent meningitis.

Among the causes, sinusitis is probably the most frequent and of the sinuses the ethmoid is the most common original focus. This is due to an enclosed empyema of the ethmoid cell with dehiscence of its very thin outer wall and a resultant extension of the inflammation through the orbital periosteum into the orbit. Frontal sinusitis is probably the next in frequency, as in enclosed empyema of the sinus the floor frequently necroses with a resultant abscess formation in the orbit posterior to the globe. Two years ago, we had such a patient who presented proptosis but with no actual abscess formation. This cleared up with external operation on this sinus. In maxillary sinusitis orbital phlegmons are frequently due to dehiscence in the

\* From the Eye, Ear, Nose and Throat Division of the Henry Ford Hospital.



roof of the maxillary sinus and with an enclosed empyema, pressure being sufficient to produce phlegmonous inflammation of the orbit. Occasionally in osteomyelitis of the superior maxilla, secondary to alveolar abscess, pus may force its way beneath the periosteum, producing an abscess of the orbit.

*Course.* 1. The orbital phlegmon may subside spontaneously with absorption of the exudate and return to normal of the protruded eyeball. However, frequently there is a residual slight proptosis or enophthalmos.

2. Often there is slight paralysis of the external muscles due to involvement of the oculomotor nerves.

3. Orbital phlegmons may give rise to involvement of the optic nerve by inflammation of vessels, as the ophthalmic artery, which enters the optic nerve from without, one and one-half inches posterior to the globe. If the orbital phlegmon is in the posterior part of the orbit the last ethmoid cell may be a focus, acute neuritis with atrophy of the optic nerve may be the result for the last ethmoid cell forms the outer boundary of the optic foramen. Panophthalmitis occasionally forms as a result of suppuration in the choroidal veins.

4. Detachment of the retina, purulent meningitis and brain abscess may result from this inflammatory condition.

*Treatment* in this condition is to try to remove the cause, as follows:

1. Treatment of septic wounds of the orbit.

2. Provide for the escape of secretions from the wound.

3. Removal of foreign body.

4. Treatment of suppurative osseous conditions in the neighborhood—such as ethmoid, frontal and maxillary sinusitis. Frequently nasal operations on the ethmoid will be sufficient to drain the orbital abscess without any actual entering of the orbit itself. If an abscess develops, it should be opened as soon as possible. The point of entrance should be at the point of

localization of tenderness and swelling. Very frequently an actual pus pocket is not found owing to the failure to localize. If no pus is found, however, the operation is not a failure in that relief of tension of the orbital tissues is thus obtained to prevent further protrusion of the eye and possible necrosis of the cornea from pressure of the overlying eyelids.

*Statistics.* I have found no definite statistics in the literature, which I have carefully searched. Doubtless no one had had sufficient personal experience with this class of cases to justify statistical results.

In the several cases that we have had, one patient has complete atrophy of the optic nerve as a result of the orbital phlegmon. The remaining ones have good vision, including this patient.

The important point which I wish to stress is that the sudden onset of proptosis without evident inflammation of the lids, associated with the conditions previously mentioned—severe cold, erysipelas, sinus infection, and alveolar abscess and with high fever, frequently means orbital suppuration.

*Treatment* is urgent.

1. Diagnosis of the etiological factor must be made and treatment undertaken at first through the etiological factor, as in sinusitis.

2. If sinusitis is the etiological factor treatment should be directed toward the ethmoid sinus. An incision as for external frontal and ethmoidal sinus operation is the most favorable approach in that it provides room for exenteration of the ethmoids and investigation of the frontal sinus if the diagnosis should be in doubt.

In this most recent case we found inflamed periosteum over the region of the ethmoid cells. Cultures from both the orbits and this inflamed periosteum showed streptococcus hemolyticus.

The patient, aged six years, was brought to the hospital May 14, 1926. She gave a history of an acute cold for a week or two and two days before admission the right eye became very much inflamed and proptosed. The lids were

closed and very much inflamed. The eye protruded almost 1 cm.

Under ethylene gas, incision was made in the eyebrow extending from the left of the supra-orbital nerve in front and below the inner canthus. The periosteum was elevated over the os planum. The posterior ethmoid cells were found to be very markedly diseased and opposite to them there was an erosion of the periosteum. This was incised, a small forceps was introduced, about 1 dram of pus was evacuated. Free entry way into the nose was secured by removal of all ethmoid cells opposite this. No attempt was made to do any nasal work. A rubber dam drain was inserted. The temperature did not reach above 101 degrees following

this. She was dressed every two or three days and on June 12, the wound had completely healed. There is fairly good movement of the eye in all directions. Culture showed hemolytic streptococcus.

### Discussion

DR. E. L. WHITNEY: I saw a man two or three years ago who had a phlegmon of the orbit. I never could demonstrate a sinus abscess, although I thought possibly that was what was wrong. He had no pus in the nose, and the sinuses were clear to transillumination. When he got over his influenza he came to the hospital. The proptosis disappeared in a month, and he again had normal vision.



# MULTIPLE ADENOMA OF THE THYROID COMPLICATED BY TULAREMIA\*

A. B. McGRAW, M.D.

DETROIT

THE following case is reported solely on account of the interesting association of two conditions, one of them common enough in this region, the other rare; and because the results of treatment to date seems to justify the way in which the problem presented was met.

The patient, Case 88195, is a housewife, aged forty years, of German-American stock, married for nineteen years and mother of six children, admitted to the Henry Ford Hospital on January 26, 1927.

*Chief Complaint.* Suppurating glands in the right elbow region and a painful swelling in the right axilla.

*Present Illness.* Two months ago two lymph nodes in the right epitrochlear region became swollen, tender, and fluctuant. At the same time the patient experienced a couple of days of general malaise of unexplained origin, associated with nausea, vomiting and feverishness. The glands were lanced several times by the patient's family physician with the evacuation of pus and relief of local symptoms, but had refused to heal. Within the past week a tender swelling gradually appeared and increased in the right axilla. During the past year nervousness, asthenia, and tachycardia had been noticed in increasing degree but had been much more marked during the past two months. There was a loss of 20 pounds in weight noticed during the year.

*Past History.* Measles as a child. No injuries or operations. Eight pregnancies (including two miscarriages) in nineteen years. Otherwise negative.

*Family History.* No known cases of goiter, diabetes, or cancer. Mother died of tuberculosis.

## *Summary of Physical Findings.*

*General.* A slightly emaciated middle-aged woman, looking chronically sick. Obviously nervous and restless. Temperature 99° F. (mouth), pulse 140, respiration 22.

*Eyes.* Moderate staring. No exophthalmos, von Graefe, Moebius, or Stellwag signs. Fundi normal. Ametropia.

*Ears and Nose.* Negative.

*Mouth and Throat.* There had been recent extractions of all teeth.

*Lungs.* Negative to percussion and auscultation.

*Heart.* No enlargement, murmurs, irregularity of rhythm, or electrocardiographic signs of myocarditis. Rather marked sinus tachycardia.

*Abdomen.* Negative.

*Pelvis.* Moderate scarring from lacerations of cervix. Marked chronic cervicitis, and leucorrhea.

*Rectum.* Negative.

*Reflexes.* Hyperactive.

*Lymph Glands.* (a) Right epitrochlear region. Two slightly enlarged and semifluctuant glands each with a small recent incision, the edges of which are glued together if not actually healed. These glands were neither tender nor red, on admission.

(b) Right axillary region. What felt like a single enlarged, fluctuating gland in the lower axilla, 2 X 2 X 3 cm. in size. The overlying skin only slightly red and tender.

(c) Other groups of glands, not enlarged, not tender.

*Extremities.* Marked fine tremor of hands.

*Thyroid gland.* Irregular nodular enlargement, three to four times natural size, involving both lobes and isthmus of the gland, especially the left lobe. On the left side the enlargement of the lower pole extended beneath the clavicle.

*Routine Laboratory Findings.* Blood Wassermann reaction negative. w.B.C. 9050; Differential, P.M.N. 69 per cent; P.M.E. 6 per cent; S.M. 18 per cent; L.M. 7 per cent; Urine: sp. gr. 1025; albumin negative; sugar, negative; microscopic, w.B.C. 1 plus.

*Other Laboratory Tests.* Basal metabolic rate plus 75 per cent; blood chemistry: N.P.N. 27.3; Urea nitrogen 14.9; blood sugar 108; blood culture, no growth.

*Comment.* The combined symptoms of marked nervousness, tremor, tachycardia, loss of weight, asthenia and staring expression, coupled with a high basal metabolic rate made

\* From the Surgical Department of the Henry Ford Hospital.

## McGraw—Tularemia

a diagnosis of hyperthyroidism obvious and easy. The indicated treatment for this condition, a period of rest followed by thyroidectomy, was equally obvious. The diagnosis of the nature of the axillary abscess for which she had entered the hospital was not as obvious and might easily have been overlooked had not another case of tularemia been seen in the hospital some three weeks previously. The rather slow development of the axillary mass, preceded by two indolent epitrochlear abscesses, was decidedly unlike a streptococcus infection. A staphylococcus infection could not be ruled out, however. Questioning revealed that the patient had bought in the open market, prepared, cooked and eaten rabbits on at least three occasions during the Fall of 1926. This, coupled with the history of a small infected scratch on her right hand, followed by a spell of vague general malaise, then the epitrochlear abscesses and finally the axillary abscess made a diagnosis of tularemia highly probable. A specimen of the patient's blood was sent at once to the laboratories of the U. S. Public Health Service at Washington and the following report obtained: "Serum agglutinates with *B. tularensis* in a dilution of 1:160, not complete in a dilution of 1:320. No agglutination with *B. abortus*."

**Course in Hospital.** On the day following admission the axillary abscess was opened under ethylene-oxygen anesthesia and about 35 c.c. of thick yellowish, odorless pus was evacuated, entirely relieving the patient of her painful symptoms. We hoped that the abscess cavity would heal within a week or so and thus allow us to proceed with a thyroidectomy which she badly needed. It not only showed a very sluggish tendency to heal but both epitrochlear glands began again to show signs of fluctuation. A check on her basal metabolism on January 31 showed a rate of plus 32, but the patient was steadily losing weight and her ability to resist infection seemed on the decline. Confront-

ed with the dilemma either of performing a clearly indicated and presumably clean operation in the presence of an active infection elsewhere, or entering on an indefinite period of treatment of the hyperthyroidism and the felt that relief of the hyperthyroidism and the improvement it would surely bring to the patient's general health was worth the risk of a wound infection. On February 2, 1927 a subtotal bilateral thyroidectomy was performed removing all adenomata and leaving but a very small trace of thyroid tissue. The operation was well stood by the patient, and we were delighted to observe that the wound seemed to heal entirely without reaction or sign of infection. The two epitrochlear glands were reopened on the day the thyroidectomy was done, and both they and the axillary abscess were practically healed by the time the patient left the hospital on February 13, eight days after operation. On the day before discharge a basal metabolic reading was plus 6 per cent. On April 15, 1927, the rate was minus 10 per cent, and she has been started on a dose of  $1\frac{1}{2}$  grain whole thyroid a day. This has since been discontinued.

**Postoperative Course.** Three days after discharge from the hospital the patient returned to the clinic with a puffy, fluctuating, tender, red area on the right side of the neck at the scar line, about  $2 \times 3$  cm. in size. She was questioned closely but was sure there had been no sign of it until the night before. The fluctuating area was incised under local anesthesia and about 20 c.c. of pus evacuated, similar in character and appearance to that from the axillary abscess. A culture of this pus grew only a Gram negative bacillus. This wound was dressed every 2 or 3 days, and healed within ten days. Whether this wound infection was caused by the *B. tularensis* or not is of course entirely a matter of conjecture, but with the coexisting abscesses in axilla and arm, it seems quite possible that it was.

# UNRUPTURED INTERSTITIAL PREGNANCY\*

H. M. NELSON, M.D.

DETROIT

IN the following case an attempted criminal abortion in an apparently normal pregnancy was followed by what was thought, to be a normally progressing pregnancy.

Mrs. R. H., white, aged twenty-nine years, had been married ten years, and had three children living and well, the fourth, born in 1919, having died after five months of pneumonia. She had had one early abortion without complications. All the labors and puerperia were normal.

Menstruation began at the age of 14. It is of the twenty-eight day type, lasts three days, and the flow is moderate, and without pain.

The patient's last menstrual period ended February 5, 1925. In April she used "slippery elm sticks" to induce an abortion. The next day she had some uterine bleeding, followed in two days by chills and fever and general malaise.

On April 22 she was admitted to the hospital. There was generalized tenderness throughout the lower abdomen. The fundus was large and very tender with marked induration and tenderness in the region of both adnexae. A diagnosis was made of pelvic peritonitis, metritis and perimetritis. Her hemoglobin was 52 per cent, W.B.C. 11,500, P.M.N., 79 per cent. Her temperature was 100° F., pulse 110, respirations normal. She remained in the hospital for eight days, at the end of which time her temperature returned to normal, and she was feeling quite well. She was seen again in the Out-Patient Department June 14, because of a severe pain through the lower abdomen, more marked on the right side. At that time the vaginal mucosa was blue, the cervix was enlarged and soft, there was a mass which rose within a finger breadth of the umbilicus. This mass was irregularly softened and felt like a normally progressing pregnancy. Because of the temperature of 99.4° F. and the severe pain, the patient was again admitted to the hospital. Her temperature soon fell to normal, and she was discharged at the end of the second day.

On July 2 she was examined again. The

uterus seemed about the size of a five months' pregnancy. There was great tenderness in the region of both tubes and ovaries, more marked apparently on the left side. Her temperature was 99.8° F., and she complained of some frequency and dysuria and pains in the left lower quadrant. On July 21 the patient began having a few cramps, which were followed by a bloody vaginal discharge. July 23 she had a sudden gush of fluid. The next day the uterus was a little smaller than formerly, and there was less tenderness in the abdomen. We thought at that time that the patient would abort. On August 20 she was examined again, and the uterus seemed definitely smaller than previously. The patient said she had been having a foul-smelling brownish discharge, with some bright blood at times. When seen in September she had been feeling quite well; there had been a little bright red discharge; the uterus was definitely smaller, but still considerably larger than normal. She was examined the first of October. At that time the uterus was about the size of a three months' pregnancy and rather hard and freely movable, and the cervix was closed. She returned to the hospital October 15, stating that for the previous twenty-four hours she had been having considerable bleeding. The uterus was about the same size as that at the last examination, at which time it was felt that the patient should be curetted, and this was done in August. The left wall of the uterus seemed about normal thickness. The right cornu was about 2 inches thick, feeling like an intramural fibroid in this region. The uterine cavity itself did not contain any product of pregnancy. It was curetted, but nothing abnormal was obtained. Pathological examination showed no suggestion of fetal tissue. The patient made an uneventful recovery from this, and left the hospital three days later. On November 19 she returned. The enlargement in the right cornu of the uterus was about the size of a baseball. It was discrete, firm and not tender. The uterus was quite movable. We made a diagnosis then of fibromyoma of the uterus. In December she was examined again, and at that time we advised operation for fibromyoma.

\* From the Gynecological Division of the Henry Ford Hospital.

On December 30, 1925, hysterectomy, appendectomy and a right salpingoophorectomy were performed. The note dictated at the operation was as follows: "In the pelvis the fundus is distorted by a large fibromyoma in the right cornu which has undergone considerable degeneration. The omentum is implanted on the tumor and supplies part of its circulation. There is a softer pedunculated fibroid in the left broad ligament. The fibroid at the cornu of the fundus involves the area at the base of the tube and the round ligament so that it seems necessary

can be followed to its open fimbriated end. The ovary is of fair size and pale with several cysts in it. The uterine canal is somewhat wider, also the mouth is more open, than usual. The endometrium is smooth, pale and clean. In the fundus a thin, elongated, mucous polyp can be seen. The wall is everywhere thick and succulent with dilated vessels. At the cervix the thickness of the wall is 11 mm., increasing until in the fundus it is 22 mm. The mass in one cornu is covered with dry and yellowish peritoneum. The mass feels finely nodular and hard, giving the impression of a neoplasm undergoing necrosis and calcification. On cut section it is found to consist of an interstitial pregnancy of the tube at the point of insertion of the latter into the uterus. The placenta is showing necrosis and the fetus, maceration and necrosis."

The patient made an uneventful recovery from the operation, and was discharged November 15.

Next to ovarian pregnancy interstitial pregnancy is the rarest form of ectopic gestation. According to Rosenthal,<sup>1</sup> who has reviewed over 1300 cases there were only 3 per cent interstitial pregnancies. Wynne<sup>2</sup> thought that the percentage was much less than that and in 304 cases he found only 1.5 per cent interstitial.

A positive diagnosis of interstitial pregnancy before rupture is very difficult and is quite impossible after rupture because the symptoms are identical with those of a ruptured tubal pregnancy. The diagnosis before rupture depends upon the usual ectopic history, the associated signs of pregnancy and particularly the detection, upon vaginal examination, of an irregular enlargement extending around one uterine horn, with a broad base upon the uterus. The enlarged area may be very firm, from tension, and give one the impression of a fibroid. In most of the cases reported the pain is early and usually develops before bleeding or death of the ovum takes place.

Because of the rich blood supply at the cornu of the uterus severe hemorrhages are apt to occur at rupture. Wynne gives the mortality as 11.9 per cent.

The treatment is always surgical,



Two drawings of the specimen after it had been fixed: the upper one showing the fetus in place; the lower one a posterior view.

to remove the whole uterus in order to care for the broad attachment of the fibroid. Right tube and ovary are removed together with the uterus."

The pathological examination of the specimen showed: "The uterus is slightly enlarged, 12 cm. long. At one cornu the adnexae are missing. At the other cornu there is a globular mass the size of a baseball that is not pedunculated but forms a thick based continuation of the uterus. From this mass the patent tube

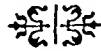
whether ruptured or not. Very few cases of unruptured interstitial pregnancies have been operated on. Rupture generally occurs early, between the second and third month.

The type of operation should be selected to fit the emergency. Hysterectomy is usually preferred. Excision of the cornu

may be done more quickly in moribund cases.

#### REFERENCES

1. LEVY, W. E. Interstitial pregnancy, with the report of unruptured case. *Am. J. Obst. & Gynec.*, 1925, ix, 93-100.
2. WYNNE, H. M. N. Interstitial pregnancy. *Bull. Johns Hopkins Hosp.*, 1918, xxix, 29-35.





TRANSACTIONS OF  
THE SECTION OF SURGERY  
NEW YORK ACADEMY OF MEDICINE

Meeting of April 1, 1927

THE CHAIRMAN, DR. FREDERIC W. BANCROFT, PRESIDING

THE IMPORTANCE TO SURGERY OF THE  
CYSTIC DUCT

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NEW YORK

IN the course of a study of the cystic duct of the human being and its possible relation to the normal function and also to the pathology of the gall bladder, certain questions have arisen, the answers to which would seem to be of particular interest to the surgeon. I have reached the tentative conclusion that the symptomatology of gall-bladder disease depends upon the degree of the direct or indirect involvement of the cystic duct; or, to put this statement in the form of its corollary, that the gall bladder itself is not the point of origin of symptoms. One definite example of this possibility is that a gall bladder, filled with the stones which have been called "innocent" gall stones—which are, indeed, innocent of immediate symptoms, however lacking in innocence in respect to future processes they may be—will show no symptoms whatever; while one single stone caught in the cystic duct will call forth the characteristic train of symptoms.

It may be called an axiom of the surgery of the intra-abdominal organs that pain is an expression of tension. This is not only true of intra-abdominal surgery, for that matter, for the analysis of pain in any portion of the body leads to this concept of tension. Just as the stomach

can be cut, sewn, burned, causing no pain so long as tension is not exerted on the structures which hold the stomach in position, so the gall bladder can be operated upon without causing pain, provided tension is not exerted upon the suspensory apparatus. The portion of the gall bladder and cystic duct that possesses the least mobility and that is least able to be expanded without tension upon surrounding structures is the cystic duct, lying as it does enclosed in the ligamentum hepato-duodenale.

The anatomy of this region has been elaborately described by Lütken's in his recent book "Structure and Function of the Extra-hepatic Biliary Passages." Time does not permit a discussion of these details and I refer those interested to this exceedingly valuable volume.

The general outline of the anatomy is seen in the schematic drawing (Fig. 9), which shows the division of the gall bladder into the body, the fundus being the portion of the gall bladder that hangs below the liver edge and is not always present, the infundibulum, to which is attached, often broadly and intimately, the neck, which in turn passes into the cystic duct. Lütken divides the cystic duct into two parts: a smooth portion, joining the hepa-

# PLATE I

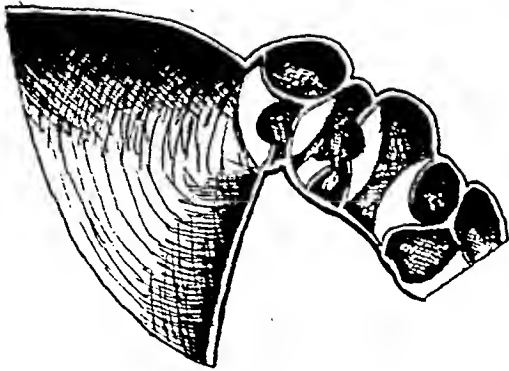


Fig. 1

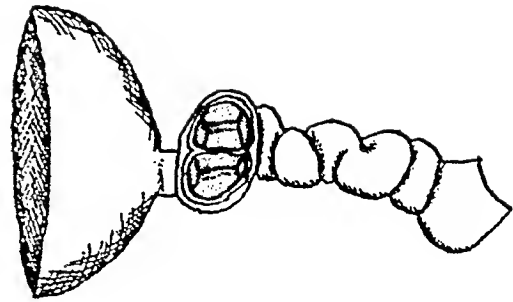


Fig. 5



Fig. 2

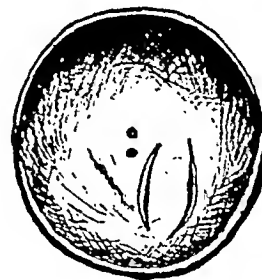


Fig. 6

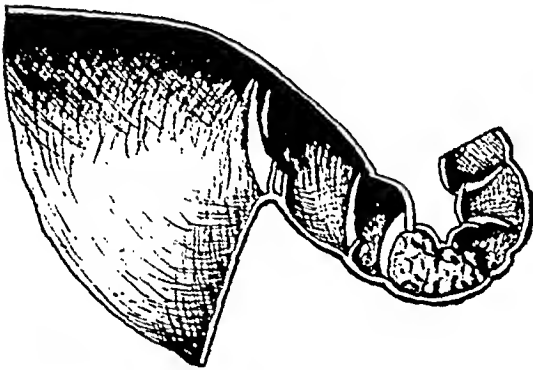


Fig. 3

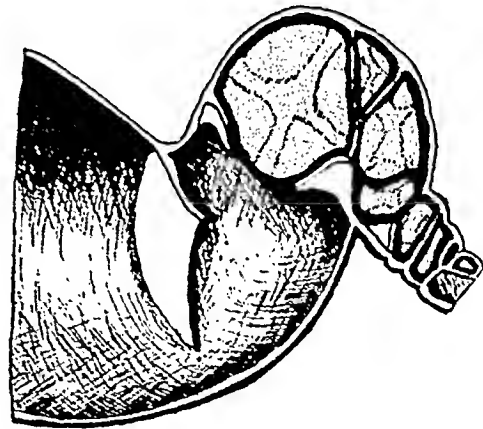


Fig. 7

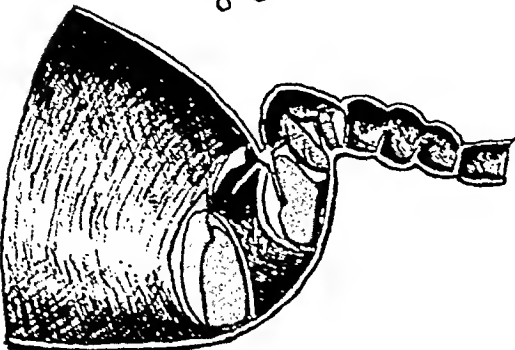


Fig. 4

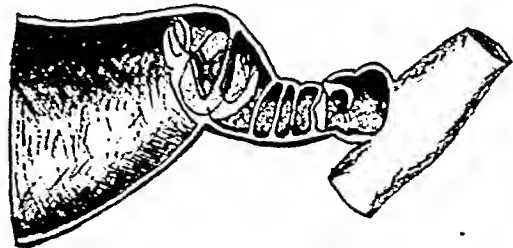


Fig. 8

The division of the cystic duct into pockets by the valves of Heister, and the manner in which these pockets determine the size and shape of the multiple faceted gallstones.



tic, and a valvular portion joining the neck of the gall bladder. At the point where the valvular portion of the cystic duct joins the collum, Lütken's describes a sphincter muscle.

This brief résumé of Lütken's description will suffice, at least, to point out that the various students of the gross anatomy of the cystic duct do not all think alike. It seems to have been always thus, for Heister,<sup>2</sup> who first described and pictured the valves of the cystic duct, mentions that Glisson, the English anatomist who died a few years before Heister was born, had never encountered these valves. Lütken's sees valves only in the portion of the cystic duct nearest the gall bladder. Mentzer<sup>3</sup> seems to attach little importance to the valves of Heister and says that there were none at all in eight of his cases. On the other hand, in my own studies every specimen in which the cystic duct is complete shows the valves extending clear to the junction with the hepatic duct. In other words, there is no smooth portion of the cystic duct, no portion free of valves.

As regards Mentzer's findings and conclusions, I have never found a specimen from the human being which fails to show these valves of Heister. They vary greatly in their number and complexity, they may be much smoothed out by the dilatation of the duct that follows the impaction of a stone, but they are always present. These valves are not found in any animal that I have been able to study. I suspect that the differences in findings that have been reported depend upon differences in the choice of the method of study. The method used by Heister has given the best results in my hands—the oldest method for making permanent specimens of the hollow viscera, simply to blow them up with air and then let them dry. A cannula is tied into the common duct or the fundus of the gall bladder, the organ is distended with air to its normal size, the peritoneal covering and the underlying fat are removed and the specimen is allowed to dry in the air. The removal of

the fat is simply to insure the permanency of the specimen. This simple method suffers somewhat from the fact that a certain amount of shrinkage takes place on drying, an objection which may be partly obviated by leaving a constant pressure on the specimen while it is drying. This is accomplished by interposing the rubber balloon of the ordinary cautery bag between the source of air pressure and the gall bladder, and allowing the distended rubber bag to supply counter-pressure against the shrinking effect.

The second best method in my experience is to distend the specimen with formalin and then to immerse this distended object in formalin. This method gives very excellent results. It makes it unnecessary to dissect off the fat, and preserves the specimen in such condition that microscopic studies can be made if desired. The objection is that formalin specimens are not very pleasant things with which to work. With either method, the specimen is cut into halves as accurately as possible to show the internal arrangement.

A combination of these two methods may be used to bring out certain features which neither of the described methods alone shows so clearly. The specimen is distended with formalin and fixed in toto without any dissection. After fixation the specimen is dissected, filled with air and dried. This method preserves the normal curves of the cystic duct as shown in Figures 10 and 11, in which also the apparent narrowing of the duct at one point together with the more or less complete turn of the duct at this point can be seen. In such a specimen, if it is desired, the blood vessels may be left and will show how these curves of the cystic duct seem to be maintained by the blood vessels which, arising from the level of the common and hepatic ducts, cross to the infundibulum of the gall bladder in a perfectly straight line.

That this choice of method is of basic importance, is seen, I believe, in Lütken's own work. The pictures he gives of roentgen-ray studies of the cystic duct (Fig. 12)

show distinct evidences of valves in the cystic duct clear to the common duct; while his pictures of fresh specimens (Fig. 13) show what might be interpreted as a smooth portion. Mentzer's work, if we may judge from his illustrations, was carried out either with fresh specimens or with ordinary formalinized material (Fig. 14).

Figure 15 brings out another point concerning the method of study. The upper portion of the figure is a drawing of a

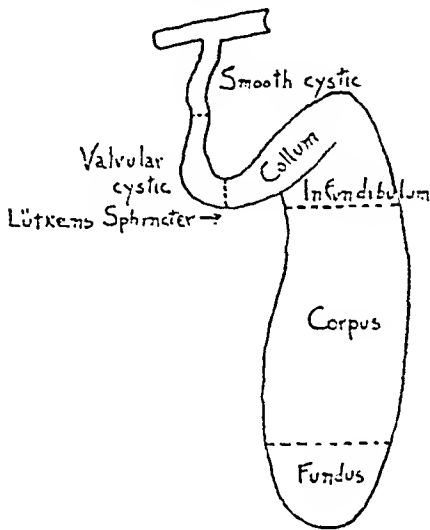


FIG. 9.

dried specimen with a silk thread carried through the openings from one chamber to the next to bring out the fact that the actual channel of flow through the cystic duct is far more tortuous even than are the actual twists and turns of the cystic duct. It also shows why the surgeon has difficulty in passing a probe through the cystic duct. The lower part of this figure is a photograph of the same specimen which shows how inadequate is photography to bring out the details. This difficulty is based upon two things, the half round shape and the lack of color contrast.

There is some evidence in the literature (Higgins and Mann<sup>4</sup>) that points to the existence in the cystic duct of some sort of a sphincter. My own studies have impressed me with the fact that there is a

distinct narrowing at about the middle of the cystic duct and that this narrowing coincides with a complete turn or a U-shaped bend in the line of flow of the cystic duct, meaning by this the line which may be followed by passing a thread through the openings from one chamber to the next.

My conclusions concerning the cystic duct of the human being are: first, it is an extremely tortuous tube containing on the inside, throughout its entire length, an arrangement of folds of mucous mem-

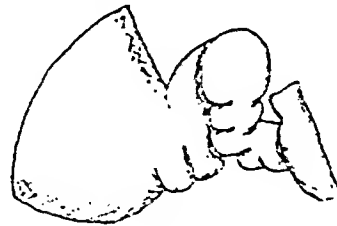


FIG. 10.

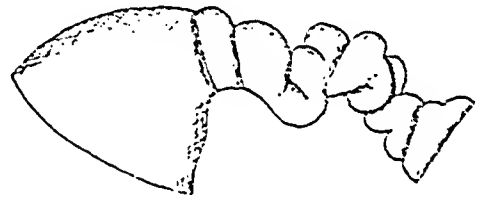


FIG. 11.

brane which are placed in a more or less spiral fashion, but which divide the cystic duct essentially into a series of little chambers. The openings from one chamber into the next are not opposite each other but are so placed that the channel of flow is even more tortuous than would be determined by the external form alone; second, the actual number of these valves is inconstant and the shape of the chambers formed by them is never the same in any two specimens; third, the purpose of this curious arrangement is not clear. It might be a mixing device. It might be a device to impede the flow of bile from the gall bladder. Such an arrangement would offer resistance in direct relation to the viscosity of the fluid flowing through it; and there can be no question, from the work of Rous and McMaster, that bile flowing out of

the gall bladder (if bile ever normally flows out of the gall bladder) would possess at least ten times the viscosity of bile flowing into the gall bladder, since it is at least ten times as concentrated as liver bile.

Whatever the normal function of these little chambers along the cystic duct may be, I am convinced that their size and shape determine the size and shape of the multiple faceted gall stones found in the gall bladder. Without exception in

processes take place that change this colloidal mass into so-called stones. The cystic duct becomes blocked. The pressure which we know causes a dilatation of the entire extrahepatic duct system after cholecystectomy, in the presence of a competent sphincter of Oddi, forces the stone out of the cystic duct into the gall bladder, since the blocking of the duct by the stone has produced a functional cholecystectomy. The process then repeats itself until we may find a large collection of stones all



FIG. 12.



FIG. 13.

every gall bladder containing multiple faceted gall stones that I have obtained with ducts attached, the multiple faceted stones found in the gall bladder were seen to fit into the pockets along the cystic duct and the neck and infundibulum of the gall bladder; and the shape of these pockets may be predicted from the form of the stones found in the gall bladder. I believe that these stones must arise as soft masses which lodge in these pockets and conform to the shape of the pocket. Chemical

of the same size and shape, or of varying sizes and shapes, according to the character of the pockets formed by the valves of Heister.

The same difficulty presents itself here as in the study of the cystic duct in the matter of the method of presentation of the results. Photography is the proper and preferred method in scientific work, but it has proven entirely unsatisfactory.

I therefore present my results in the form of pen and ink drawings in which I

bring out the gall stones by the use of a simple contrasting color. It is to be understood that this is not the natural color of the stones under consideration but is chosen merely for contrast. Figure 1, Plate 1, is presented to show the depth of the pockets along the cystic duct, as well as the tortuous channel of flow of the bile from one chamber to the next. Figure 2 brings out the same point with the aid of a silk thread following the channel of flow and also shows how these pockets may

the stones are flat with smoothly rounded edges and no suggestion of the mulberry type. This specimen shows very curious pockets on the wall of the infundibulum in which the stones seemed to fit.

Figure 5 presents a gall bladder which contained one large round stone of the size of an English walnut, 3 smaller stones of about one-third the size of the large stone, and 12 small stones, peculiar in that each possessed one plain surface, which surface was free of a coat of black



FIG. 14.

occur along the wall quite outside the channel of flow. Figure 4 shows a similar pocket containing a gall stone. Figure 3 presents a gall bladder containing numerous black "mulberry" masses of pigment. These masses were all characterized by a dumb-bell shape and all seemed to fit this portion of the cystic duct as shown in Figure 3. Figure 4 presents a gall bladder containing 18 stones composed of the same material as the mulberry stone in Figure 3, but in the case shown in Figure 4



FIG. 15.

pigment that covered the remainder of the stone. It would seem therefore that this plain surface had been in such a position that no pigment could be deposited upon it. On preparing this specimen, 2 pockets were found at the junction of the gall bladder and the cystic duct into which these little stones exactly fit. This gall bladder was peculiar (Fig. 6) in that the valves of the infundibulum had apparently become injured, and on healing left only 2 pin-hole apertures, through which bile gained access to the gall bladder. Figure 7 presents a gall bladder containing a large number of stones of different size and shape which fit accurately the pockets of different size and shape along the cystic duct. The very small stones in Figure 7 fit little pockets that are outside the stream of bile. Such pockets seem to be not unus-



ual. In Figure 2 the pockets in the beginning of the gall bladder lie outside the stream of bile. Figure 8 shows a gall bladder containing 500 small stones of varied size, among them several very small stones which seem to fit accurately this side pocket.

If I am correct in the ideas I have presented, the cystic duct is of importance to surgery because it is the area in which tension produces the characteristic train of symptoms. This tension is the stretching of the wall of the cystic duct by the secretory pressure of the liver working against a competent sphincter of Oddi, the gall bladder being closed by a stone that has formed in the pockets of the cystic duct, behind the leaflets of the valve of Heister.

Gallstones become impacted in the cystic duct not on their way out of the gall bladder, but on their way into the gall bladder. This same pressure acts after the surgical removal of the gall bladder as well as after the just described functional removal of the gall bladder by a stone, and if the cystic duct is left behind, the same symptoms will persist after the cholecystectomy.

We are familiar with the reason why surgeons do not remove the cystic duct in the operation of cholecystectomy—the fear of injuring the common duct and the consequent irreparable stricture. Nevertheless, if I am correct in my surmise, this failure to remove the cystic duct leaves just that portion of the system which produced the original symptoms and will probably continue to call forth symptoms until the physiological processes involved shall have adjusted themselves.

I present for surgical discussion two thoughts: the more complete removal of the cystic duct; or, making the sphincter of Oddi incompetent by section.

#### REFERENCES

1. LÜTKENS, ULRICH. *Aufbau und Funktion der extrahepatischen Gallenwege*. Leipzig, 1926.
2. HEISTER, L. *Compendium Anatomicum*. Amsterdam, 1723, p. 240.

3. MENTZER, STANLEY H. The valves of Heister. *Arch. Surg.*, 1926, xiii, No. 4, 511-522.
4. HIGGINS, G. M., and MANN, F. C. Emptying of gall bladder. *Am. J. Physiol.*, 1926, lxxviii, 345.

#### Discussion

DR. JOHN C. A. GERSTER: It is very interesting to consider what Dr. Sweet has just told us in conjunction with a lecture by Prof. Asehoff in which the latter called attention to the fact that cholecystectomy did not always relieve the patient of stones and that the cause was probably due to some embarrassment of the autonomic nervous system. Does Professor Sweet know of any cases where, a few months after cholecystectomy, the patient had a typical gallstone attack accompanied by fever and jaundice and where after one or two attacks, the common duct has been opened and no stones found, merely a few cholesterol crystals floating around in the bile or, at times, tiny, round calculi the size and shape of shad roe?

DR. MORRIS K. SMITH: The reports of the results of cholecystectomy in the literature have been, on the whole, good. Although I have never tried to remove the cystic duct, and have at times in acute cases left a little of the neck of the gall bladder, my own experience has been that a large percentage of good results may be expected.

DR. FREDERIC W. BANCROFT: We have all seen symptoms following cholecystectomy similar to those of previous attacks. It is my impression they are caused by high fixation of the duodenum. It has a tendency to be drawn up toward the stump of the cystic duct by contraction of scar tissue.

If the patient has been guilty of some dietary indiscretion and vomits, pain is probably produced by the pull on the adhesions. Roentgenography of the gastrointestinal tract usually reveals the lesion. I have operated on several of these patients, by freeing the duodenum and obtained satisfactory relief of symptoms. This would lead one to assume that not every case of pain following cholecystectomy is due to elongation of the stump of the cystic duct or to reformation of gallstones in the stump of the cystic duct or the hepatic duct.

DR. BRADLEY L. COLEY: Has Dr. Sweet data on the reformation of gallstones in gall bladders that have been subjected to cholecystostomy? A knowledge of the frequency with which gall bladders from which stones

have been completely removed by cholecystostomy reform stones would be of interest because if this occurs in any considerable proportion of cases it would be one more argument in favor of cholecystectomy rather than cholecystostomy.

DR. FREDERIC W. BANCROFT: Answering Dr. Coley, about two years ago Cameron reported in the *Journal of the American Medical Association* the case of a patient who had had careful removal of stones through a cholecystostomy was reoperated on in three months and the gall bladder was found filled with stones again.

DR. SWEET (closing): It is a difficult matter to discover the concensus of opinion among clinical surgeons as to the actual results of operative procedure upon the gall bladder. Many surgeons seem to be well satisfied with their results, and yet the reports in the litera-

ture give results quite comparable to the large series reviewed by Deaver and Bortz<sup>1</sup> which shows only 65 per cent of cholecystectomies in which the condition was entirely relieved. Dr. Smith said he did not see how the cystic duct could produce the symptoms because it is fixed and immobile. I believe that it is probably this fixation and immobility that determine the site and origin of the symptoms. The problem of the formation of gallstones is not a problem merely of infection or of bile stasis, but one involving the metabolism of cholesterol, concerning which we as yet know nothing. It is a clinical problem since animals do not show concretions containing cholesterol. The problem of gallstones is therefore one which needs for its solution the interest and cooperation of the clinical surgeons.

<sup>1</sup> Deaver, J. B., and Bortz, E. L. Gall bladder disease. *J. Am. M. Ass.*, 1927, LXXXVIII, 619.



# THE MECHANISM AND PATHOGENESIS OF ACUTE OSTEOMYELITIS

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THIS presentation is a résumé of several previous communications<sup>1,2,3</sup> in which the mechanism and pathogenesis of acute osteomyelitis were described; it is based on the conception that acute hematogenous osteomyelitis is a metastatic lesion during the course of a bacteremia, the latter resulting from an acute bacterial lesion on a surface of the body which forms the portal of entry for the infection. In this conception a surface of the body includes not only the skin, but also the entire mucous membrane of the alimentary tract, the genitourinary tract, etc. The common surface lesions include not only furuncles, carbuncles, etc., on the skin, but also lesions in the tonsils, and elsewhere, lying in the mucous membrane of the pharynx as well as less demonstrable lesions, as in Peyer's patches.

The fundamental cause of the spreading of the original lesion in the form of metastatic or subsidiary lesions is an infected thrombus lying in the original area of infection, and communicating at some point with the freely circulating blood. Organisms, growing on the surfaces of the thrombus, are discharged, or pieces of the thrombus itself break off and are discharged into the circulation and, becoming lodged for various reasons in the vascular network of various parts of the body, give rise to secondary lesions. Bone tissue, because of its peculiarities in vascular structure, seems particularly prone to the blocking of these thrombo-emboli and the susceptibility to this is particularly increased during the period of growth when the individual bones contain well-marked divisions into diaphysis and epiphyses.

The various accessory causes, such as

trauma, that determine the localization of a secondary focus of infection—fixation point—in a given bone, are associated with accidents in the local circulation which facilitate blocking of any bacterial thrombus-embolus. The essential nature of the pathologic process that develops at the fixation point is a thromboarteritis or thrombophlebitis, in which a dominating position is assumed by the secondary vascular thromboses which must necessarily occur in such a pathological lesion. The all-important secondary effect which these thromboses produce are disturbances of essential nutrition which lead to the death of certain bone cells and the consequent necrosis of certain areas of bone tissue.

The resultant lesions are understood only in the light of complete knowledge of the structure of the vascular tree of the given bone. A typical specimen of the circulation in a long bone is shown in Figure 1. There is a separate circulation for the diaphysis and for the epiphysis. The circulation of the epiphysis enters most often at more than one point, and among these, oftentimes a main channel can be distinguished.\* The epiphyses (Fig. 2) obtain their blood supply from the periosteal network of arteries, large branches of which perforate the thin layer of compact tissue on their exterior, and are distributed throughout the spongy cancellous tissue. Practically the whole of the blood supply is therefore independent of

\* In the hip joint the blood supply of the epiphysis which forms the heads of the femur is derived from a single vessel which passes to it in the ligamentum teres: The vessel is the terminal part of the transverse branch of the internal circumflex artery, a derivative of the deep profunda branch of the femoral artery.

that of the diaphysis. Only one or two minute vessels pass into the epiphysis from the diaphysis through the conjugal cartilage. This accounts for the comparatively infrequent occurrence of necrosis of the epiphysis in traumatic separation of the epiphysis even when the latter is more or less completely displaced from the diaphysis. The circulation of the diaphysis is derived from a large vessel, the nutrient artery of the bone, which enters a little to one side of the center of

tomosis between the plexus of vessels thus established and the vessels derived from the periosteum through Sharpey's fibers. In a growing bone, with the epiphyseal cartilage still present, the little direct anastomosis between epiphysis and diaphysis results in a relative avascular area; in a fully grown bone there is an extensive anastomosis between the two.

The avascular area in a growing bone results from the termination of the epiphyseal and diaphyseal circulations within

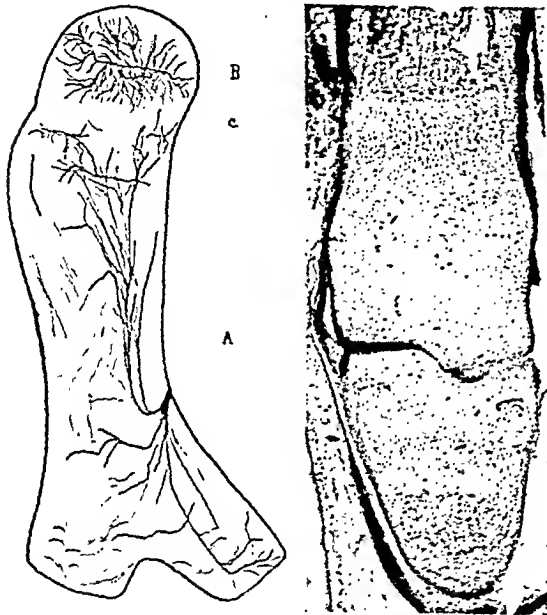


FIG. 1.

FIG. 1. Injection specimen of the vascular structure of a long bone. Note the nutrient artery and arrangement of the branches (A), epiphyseal circulation (B) relative avascular area (C). (After E. Lexer, Kuliga and Turek.)

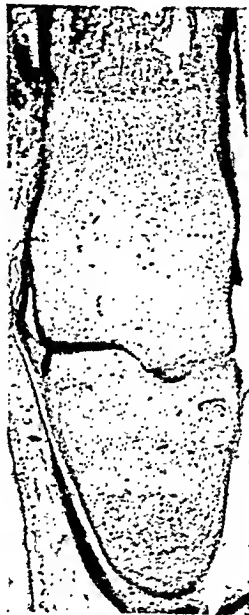


FIG. 2.

FIG. 2. Longitudinal section through growing end of a long bone of a fetal pig. Low power magnification. Note centers of ossification, relative avascular areas and distinction between epiphyseal and diaphyseal circulations.

the shaft. Immediately, the main vessel divides into a number of large branches which pass, some of them upwards and some of them downwards, towards either end of the shaft. A diffuse network is formed which supplies the entire interior of the bone and its medullary cavity. Towards the end some of the main branches become end-vessels. There is a free anas-

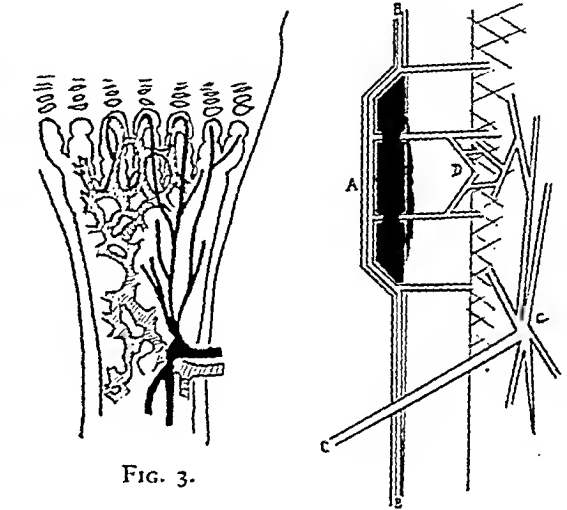


FIG. 3.

FIG. 3. Schematic drawing showing the vascular paths in the tibia of a young dog. (After Teruo Hobo.)

FIG. 4. Diagrammatic representation of the formation of a subperiosteal abscess based on a hematoma formation. BB is the periosteal circulation. CC is the nutrient artery circulation. D is the anastomatic area. If infection enter from the periosteal side of the circulation an abscess results. If infection enter from the bone side of the circulation, some disturbance of bone nutrition may follow and a slight degree of sequestration may occur. Usually, no new bone formation from periosteal activity occurs. Compare with Figure 5.

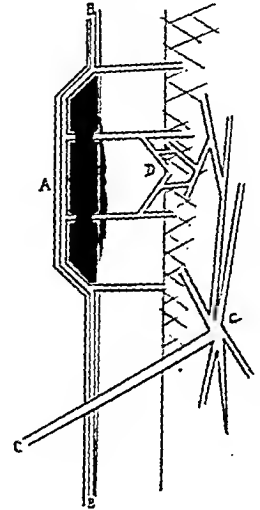


FIG. 4.

a short distance of the epiphyseal line (Fig. 2). The terminal vascular network on either side is made up of vascular loops which result from the free and extensive anastomosis (1) on the epiphyseal side of the various vessels and their branchings which supply the bone structure of the epiphysis, and (2) on the diaphyseal side of the free and extensive anastomoses of the numerous terminal loops (Fig. 3) of

the nutrient artery of the diaphysis of the bone. Near the avascular area on the diaphyseal side of the conjugate cartilage end-vessels are also present. Nutrition in the avascular area is a lymphatic affair.

circulation, in conjunction with the character, virulence, etc., of bacteria giving rise to the infection. The following general pathological pictures form the main varieties:



FIG. 5. Roentgenogram of an actual case illustrating the diagram in Figure 4; compare with the latter.

The various pathological pictures that result depend upon the size of the plugged vessel, the relative position of the plug, the powers of vascular anastomosis, the capabilities for development of collateral

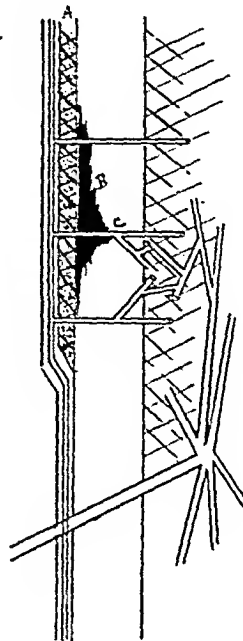


FIG. 6.

FIG. 6. Diagrammatic representation of an embolus-thrombus formation in a small cortical vessel in the mechanism of acute osteomyelitis involucrum (A), sequestrum (B), approximate position of thrombus-embolus (C). In this variety the direction of blocking of the circulation and of the entry of infection is from the nutrient artery side of the circulation. Compare with Figure 7.

FIG. 7. Roentgenogram of an actual case illustrating diagram in Figure 6; compare with the latter.



FIG. 7.

1. Figures 4 and 6 show the general arrangement of the blood supply in the general area of junction between cortex and periosteum. Figure 4 shows conditions based on a hematoma formation and in which a subperiosteal abscess forms. In addition to the rupture of Sharpey's fibers and the subperiosteal hematoma infection enters and centers in one or more of the thrombosed vessels. In many cases infection is brought from the bone side of the circulation (Fig. 4, B). Depending on amount of disturbance of capillary circulation, disturbance of nutrition can occur in the cortex of the bone, and an inconsequential sequestration can occur. On the other hand, if the infection enter the clotted

area from the periosteal side of the circulation, infection centers in the clot at the relative point A, Figure 4, and a subperiosteal abscess forms; this is the variety of case in which, after proper incision of the subperiosteal abscess healing occurs without interruption and with permanency,

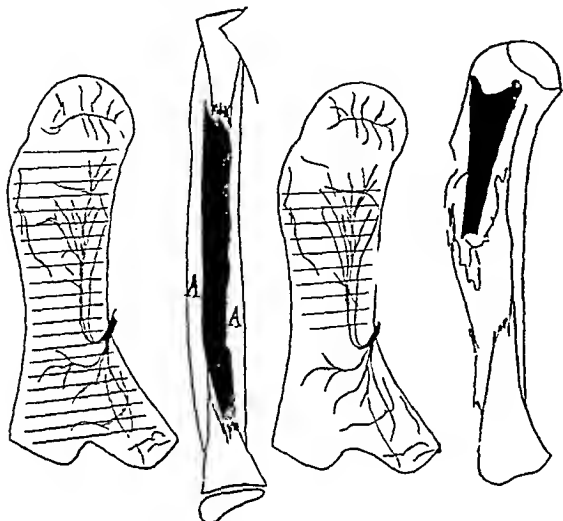


FIG. 8. FIG. 9. FIG. 10. FIG. 11.

FIG. 8. After Figure 1. Shaded area represents approximate area of bone involved when a thrombus-embolus (fixation point) occurs in the main stem of the nutrient artery. Compare Figure 9.

FIG. 9. Tracing from a roentgen-ray plate of an osteomyelitis of the radius. The black area represents the sequestered diaphysis. Such roentgenographic appearances indicate a fixation point in the main stem of the nutrient artery. Compare Figure 8, involucrum.

FIG. 10. After Figure 1. Shaded area represents approximate area of bone involved when fixation point occurs in one of the primary divisions of the nutrient artery. Compare Figure 11.

FIG. 11. A tracing from a roentgen-ray photograph of a case of osteomyelitis of the humerus. The black area represents the sequester. Note that the lesion extends through the entire thickness of the shaft and from approximately the point of entry of the nutrient artery to the extremity of the shaft. The roentgenographic appearances are those of a lesion in the primary division of the nutrient artery. Compare Figure 10.

and without involvement of the bone cortex and consequently without any sequestration of bone. There is never any roentgenological evidence of this type of subperiosteal abscess.

Subperiosteal abscesses produced by a similar mechanism occur also as manifestations of a metastatic deposit in the course

of a general infection as previously defined, and in the absence of any trauma. Figure 5 shows an actual case which corresponds to this condition.

2. Figure 6 represents conditions where the embolus-thrombus formation occurs in one of the small vessels in the cortical portion of a part of the bone. An abundant collateral circulation from both the periosteal and nutrient artery systems limits disturbance of nutrition to a minimum. Resulting sequestration corresponds with extent of disturbance of the blood supply. Involucrum formation from the periosteum is not as abundant as with the other types owing to lesser intensity and smaller spread of the process and depends for existence upon causes similar to those previously described. Various grades of this variety exist depending upon the number of small vessels involved primarily and upon the possible spread of thrombosis in the neighboring vascular network. Figure 7 shows an actual case which corresponds to this condition.

3. Figure 8 represents conditions when an embolus-thrombus formation occurs in the main nutrient vessel of a bone before its division into its primary branches. Secondary clotting is widespread throughout the entire intraosseous vascular network. The disturbance of blood supply for the given bone is of maximum degree and subsequent necrosis of the entire diaphysis is the rule. The formation of the subsequent protective involucrum is entirely due to the scatheless condition of the periosteal circulation. Under the influence of a very great increase in the blood supply the dormant activity of the periosteal osteoblast receives a powerful stimulus, new true bone tissue is formed and surrounds the sequestered shaft and an involucrum is thus formed. Figure 9 is drawn from an actual case corresponding to this condition.

4. Figure 10 represents conditions when an embolus-thrombus formation occurs in the course of one of the primary branches of the nutrient artery, close to the point of division. The disturbance of nutrition

depends upon the degree of intraosseous clotting and upon the capabilities of the collateral circulation. The segment of bone tissue destroyed corresponds closely with these conditions and involves the entire cross section of the bone. Involucrum formations follow also along similar lines and depend upon factors and processes outlined in the previous paragraph. In clinical surgery specimens are encountered in which a sequestrum removed at a subsequent operation represents the entire circumference of the bone. Figure 11 is from an actual case corresponding to this condition.

5. Figure 12 represents conditions when an embolus-thrombus formation occurs in the course of one of the subsidiary branches of the nutrient artery, close to the point of division. The disturbance of nutrition depends upon the extent of intraosseous clotting and upon the capabilities of the collateral circulation. The segment of bone tissue destroyed corresponds closely with these conditions. Involucrum formations follow also along similar lines and depend upon factors and processes outlined in the previous paragraph. In clinical surgery specimens are quite common in which a sequestrum removed at a subsequent operation represents a portion of the circumference of the bone. Figure 13 is of an actual case corresponding to this condition.

6. Figure 14 represents conditions when an embolus is arrested in a terminal branch of the intraosseous network. This variety represents the mechanism of formation of a chronic bone abscess. The arrested embolus is or becomes infected and an abscess forms around it. There can be no further spread of the process through the vascular channels of the bone because the plugged vessel is a terminal one. The spread of the abscess locally is comparatively small and is quickly limited as soon as hard bone is reached. Progress through the hard bone is very difficult and in a certain proportion only is the eroding process sufficient to open an avenue into the

soft parts. In clinical surgery the evidences of this are found in an acute or chronic osteomyelitis with or without one or more skin sinuses in which the complicated sinus leads at one point into the interior of the bone into a cavity containing pus or granulation tissue or both. In the rest of the

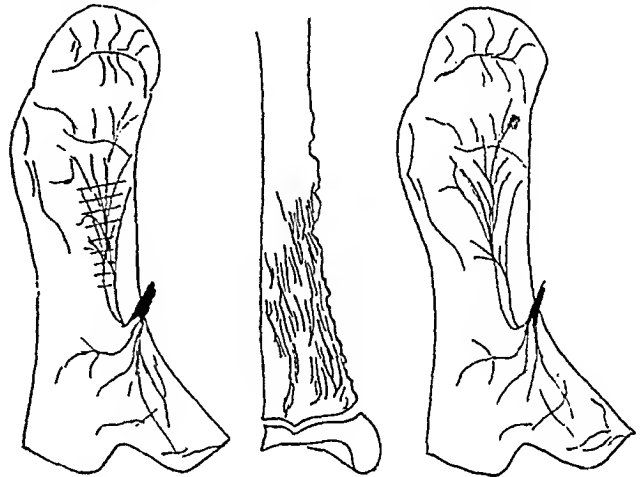


FIG. 12.

FIG. 13.

FIG. 14.

FIG. 12. After Figure 1. Shaded area represents approximate area of bone involved when the fixation point lies in a subsidiary branch of the nutrient artery. Compare Figure 13.

FIG. 13. A tracing from the roentgen-ray photograph of a case of osteomyelitis of the tibia. The area of bone involved does not extend through the entire thickness of the shaft and lies to one side of the point of entry of the nutrient artery and the diaphyseal cartilage. Compare Figure 12. The fixation point is in a subsidiary branch of the nutrient artery.

FIG. 14. After Figure 1. Shaded area represents localized area of bone involvement when the fixation point is in a terminal vessel. The result is a bone abscess. Compare Figure 15.

cases the abscess formed originally becomes localized and becomes bounded by a firm granulation member and by the hard cortex of the bone. After a while the organisms in the interior of the abscess die and a sterile collection of pus results. In clinical surgery these form the chronic bone abscesses (Brodie) and, depending on the relative time at which the abscess is opened, one may find a chronic bone abscess containing living organisms or one which is bacteriologically sterile.

7. Figure 15 represents a group of cases of acute osteomyelitis in which one or more fixation points, either simultaneously or subsequently to one another, are



formed within the confines of a single bone, at each of which a typical thrombophlebitic lesion develops independently of the others. In the early stages of such a multiple pathological formation the lesions are distinct from one another and the roentgenographic appearances follow along lines described in the previous five typical groupings. No further progression may

graphic pictures and their nature can only be surmised.

8. In a small percentage of the cases of acute osteomyelitis, the focus of infection not only involves the ramifications derived from the nutrient artery, but the periosteal network as well. Usually these are severe forms of infection and result in a total destruction of osteoblastic cells whether

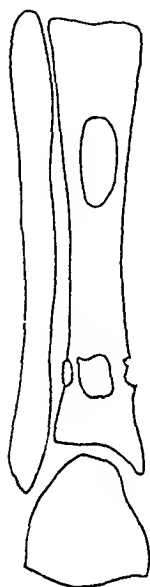


FIG. 15.



FIG. 16.

FIG. 15. Tracing of roentgenogram of a case of osteomyelitis of the tibia in which there are multiple localizations of the process. Note this is entirely different from the usual roentgenographic markings which accompany separation of a considerable part of the diaphysis.

FIG. 16. Roentgen-ray photograph of terminal condition in case of osteomyelitis of the ulna. The irregular masses of bone are involucrum formations. Note absence of bone tissue in the center. This indicates compromising of the periosteal as well as nutrient artery circulations, the former preventing any involucrum formation.

occur. In many of the cases, however, the consequences of the initial thrombophlebitic lesion involve such an extensive part of the bone, that the several foci overlap one another immediately or coalesce subsequently at their peripheries so that a fusion occurs of more than one lesion; a large atypical area of bone thus becomes involved. In such cases individual foci lose their identity in the roentgeno-

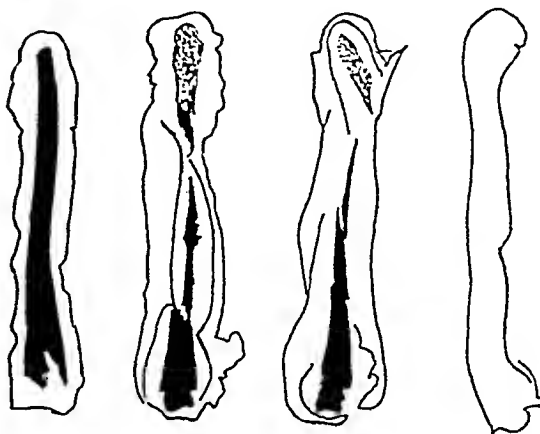


FIG. 17. FIG. 18. FIG. 19. FIG. 20.

FIG. 17. Tracing from roentgenogram of a case of "nutrient artery lesion" in an osteomyelitis of the radius. Figures 18, 19, and 20 give the further developments of this case. Figure 17 was taken October, 1924.

FIG. 18. The same as Figure 17, November, 1924.

FIG. 19. Same as Figures 17 and 18, December, 1924.

FIG. 20. The same as Figures 17, 18, and 19, February, 1925; shows one view of the end-result.

situated under the periosteum or in the endosteum. The end-result is a loss of continuity in the given bone. Figure 16 is an example of this type of osteomyelitis.

In a fairly large proportion of the cases of acute osteomyelitis, this classification simultaneously represents a classification of the end-results of this disease, as far as changes in substance, structure and form of the bone are concerned (when the contour of the bone is not mutilated in the operative manipulations that accompany an osteotomy as hereinafter described), with the exception that following the casting off of the sequestra the subsequent healing of the wound would necessarily be accompanied by the formation, in greater or lesser degree of a protective

involucrum. The character and general tendencies for the formation of the involucrum under these undisturbed conditions is best shown in all of the accompanying figures, the legends of which carry a full description of the essential steps in the course of events. Such end-results are fairly frequently seen in clinical surgery and can be demonstrated in the roentgenographic evidence and in operating-room observations. Figures 17 to 20 demonstrate the complete biological development of a case of osteomyelitis in which a nutrient artery lesion occurred in the radius of a child.

Appreciation of the statements made in the last paragraph is most important for a correct understanding of the pathological process and of its effects and for the formation of criteria upon which to formulate correct methods of surgical treatment and of operative manipulation. Whatever other changes and modifications of these underlying and essential anatomical and pathological facts and conditions are encountered in clinical, bedside and operating-room observations are directly due (1) to the spreading characteristics of a thrombophlebitic lesion in osseous tissue; (2) to the mutilations of the bone that necessarily accompany any osteotomy; (3) to combinations of both of these complicating factors; and (4) to exacerbations of infection of endogenous or exogenous origin. A correct appreciation of the effects of these complicating factors is of paramount importance in understanding of pathogenesis of complicated foci of osteomyelitis. Progressive and retrograde spreads of the thrombosis occur and explain certain otherwise inexplicable clinical facts associated with exacerbation and recrudescence or sudden unexpected enlargement of the area of bone involved in individual foci of osteomyelitis. Such effects are particularly apt to occur after operation. Roentgenograms sometimes show a spreading of the thrombophlebitic lesion which undoubtedly is intimately related to the osteotomy.

## REFERENCES

1. WILENSKY, A. O. Mechanism of acute osteomyelitis. *Ann. Surg.*, 1925, lxxxii, 781-802.
2. Correlation of roentgenographic evidence with clinical and pathological facts in acute osteomyelitis. *Am. J. Roentgenol. & Rad. Therap.*, 1926, xvi, 123-133.
3. The pathogenesis of end-results of lesions of acute osteomyelitis. *Ann. Surg.*, 1926, lxxxiv, 651-662.

## Discussion

DR. HENRY MILCH: Dr. Wilensky has brought out the idea that the fundamental factor in the development of osteomyelitis is the site of lodgment of an infected thrombus. For as long as I have had occasion to think about this problem, I have felt that the relationship between osteomyelitis and vascular supply, first suggested by Lexer and subsequently by others, must be causal in nature. However, it has seemed to me that in addition to this, there must be other factors operating. If this were not the case then we should expect that every fracture, where displacement has occurred and complete interference with the vascular supply must be predicated, would show sequestration. Except in fractures of the neck of the femur, we find only few cases out of thousands of fractures where interference with blood supply can be held accountable for the bone changes that occur. On the contrary, in the seriously comminuted fractures, where there is extensive destruction of blood supply, we find the best tendencies toward large callus formation. While significance of the blood supply in any inflammatory process will be admitted, I believe that this mechanistic explanation of osteomyelitis is somewhat too simple. I think we must admit and seriously look for other factors in the explanation of the development of the various forms of osteomyelitis.

DR. PHILIP J. LIPSETT: The theory advanced by Dr. Wilensky was first propounded by Lexer, Kuliga, Turck and others. According to this "mechanistic" view, acute hematogenous osteomyelitis is merely an accidental occurrence and location of the lesion in the bone depends only upon size of the embolus. The larger the embolus the larger is the vessel plugged, and the greater is the amount of bone involved. According to this theory, the main nutrient artery may become plugged by an embolus as shown in some of the plates

this evening, thus compromising the entire shaft.

This theory does not explain all the facts in the pathogenesis of acute hematogenous osteomyelitis for it fails to answer why this disease occurs almost only in the young between the ages of two and seventeen years; it does not explain why this disease does not occur after complete ossification has taken place; it does not explain how some of these large septic emboli, and they must be large to plug up a large vessel, pass through the pulmonary circulation. Starr, Bancroft and others have observed beginning of the lesion in the metaphysis only. I have had the opportunity to see this disease develop under my observation and I am only sorry that time does not permit me to show slides of two very interesting cases. One patient with acute gangrenous appendicitis developed tenderness over the lower end of the right tibia with a temperature of 103° F. the second day after the operation. An osteomyelitis was suspected and as soon as a swelling appeared (a subperiosteal abscess) it was incised. Daily roentgen-ray examinations show very prettily the development of the focus in the metaphysis. Another patient with peritonsillar abscess developed pain and swelling over the head of the fibula.

I have the plates of this case showing the development of the osteomyelitis process from a minute focus at the metaphysis to a stage where half the shaft became involved. Hobo's experiments with particles of India ink show definitely that when the latter are injected into the circulation they will be caught at the metaphysis where the reticulo-endothelial system is particularly rich, and where circulation is rather sluggish.

It is more reasonable to suppose that bacterial emboli (temporary bacteremias) will be caught in the zone of growth or metaphysis of the young bone and for some still unexplained reason will establish an osteomyelitis. The pus from this focus will ascend in the medullary cavity as well as burrow along the epiphysis, strip the periosteum and thus devitalize a certain segment of bone. How much bone will eventually become necrotic will depend entirely upon virulence of the organism and how early drainage is instituted. That no one theory explains the pathogenesis is obvious. Perhaps a number of factors operate to produce this disease.

DR. FREDERIC W. BANCROFT: Ritter propounded the theory which Dr. Wilensky has emphasized that the necrosis in acute osteomyelitis is due to emboli in the nutrient artery. While unquestionably emboli do frequently occur at the origin of the entire nutrient artery, it seems to me more logical to assume the emboli first start in the small terminal branches of the nutrient artery and that necrosis is produced by the retrograde thrombosis. I assume this, first, because in almost every case there is a primary onset of pain and tenderness localized over one metaphysis, second, because early cases operated upon rarely show marked necrosis, while those appearing late after the onset have a massive sequestration, often of the entire shaft.

We may assume following the formation of emboli of the terminal branches of the nutrient artery infection travels, first, by direct extension through the Haversian canals of the metaphysis to form a subperiosteal abscess and, second, by retrograde thrombosis and phlebitis following the course of the nutrient artery.

I believe that the necrosis of the bone is usually due to a circulatory interference as it follows the anatomical distribution of the nutrient artery.

DR. WILENSKY (closing): I did not refer to the literature, although I am fully cognizant of all the work referred to this evening, in order to conserve the time of my presentation. In view of the modern conceptions of acute hematogenous osteomyelitis, I believe that Lexer's work on osteomyelitis and bone necrosis should be thrown out. The anatomical work of Lexer, Kuliga and Turck is good inasmuch as it gives us the anatomical basis for this disease. Hobo's work is also anatomical. Ritter's work is good; he seems to have had the idea that there was a thrombo-embolic process and he appreciated the importance of the latter in acute osteomyelitis, but he never worked the mechanistic theory out fully along anatomical lines.

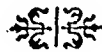
I believe that the lesion starts somewhere in the vascular network of the bone, somewhere along the nutrient artery network, in the periosteal network, or in the epiphyseal network. I have no quarrel with Dr. Bancroft's belief that the process starts in the metaphysis; but I believe he is restricting himself unduly and that this is only a part of the large

conception of the disease. One of the last pictures demonstrated apparently such an involvement and I showed it purposefully; but as one follows the later pictures one sees that the process eventually involved the entire shaft. Two explanations are available: (1) that the process extended backwards in a retrograde thrombosis; or (2) that the roentgen-ray picture shows only that part of the process in which bone absorption has taken place. Visualization of periosteal changes along the entire extent of the shaft and that, too, of about the same age in its entirety inclines me to think that nutrient artery blockage has taken place. Either of these explanations, however, is entirely satisfactory according to our mechanistic conception.

Dr. Milch brought up the question why one does not see sequestration commonly after fractures. As a matter of fact it is quite commonly seen in fractures of the neck of the femur. And Dr. Jaches has told me of a case

of a fracture of the shaft of the femur in which such a necrosis followed along anatomical lines. In several personal cases of fracture of the olecranon process of the ulna I have also seen this subsequent necrosis along anatomical lines. Dr. Milch should remember that in acute osteomyelitis one is dealing not only with anatomical things but also with superimposed infections. And simple explanations are usually right.

I have seen a number of Dr. Lipsett's roentgen-ray pictures on other occasions. And all of them seem to fall into line perfectly with my conception of acute osteomyelitis. The reason why this disease is so much more frequent in children is associated with the presence of the conjugal cartilage and with consequent peculiarities of vascular arrangements which lend themselves more peculiarly than in adults to the localization of thromboemboli in the bone vascular network. However, acute osteomyelitis does occur in adults.



# A MODIFIED BALFOUR RETRACTOR

H. DAWSON FURNISS, M.D., F.A.C.S.

NEW YORK

THE difficulties I have encountered when using the regular Balfour retractor have been the spreading of the groove in the blade handle, wearing of the threads of the holding screw, catching of dressings and ligatures on this screw,

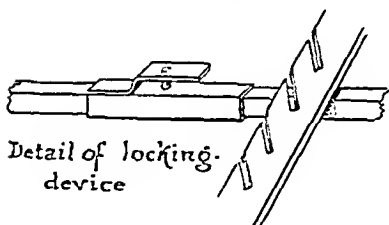
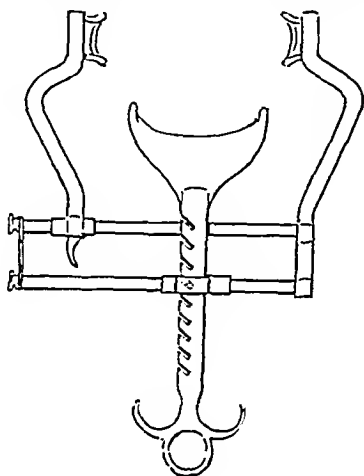


FIG. 1.

and trouble in adjusting the blade when it was not easy to enter the holding screw through dilated portions of the blade handle.

All of these difficulties I have overcome in my modification of the Balfour retractor. In this modification the blade handle is notched on one side, at three-sixteenth inch intervals, by slots that run backwards at an angle of forty-five degrees; these slots are three-sixteenth of an inch in breadth, and deep enough to reach the centre of the handle.

There is a hollow square one and one-half inches long, which moves loosely on one of the transverse bars of the retractor. On top of this is a pin slightly smaller than the slots in the handle and a bit longer than the thickness of the handle. The top of this pin is attached to a piece of metal the length of the hollow square.

In use the lateral blades are inserted and adjusted for transverse distention of the wound. The third blade is then inserted and drawn tight enough to secure the desired exposure. The slot is then slipped over the pin, the tension of the wound obviating any slippage.

The retractor is easily placed and adjusted, and remains securely in the desired position.

## PRESENTATION OF CASES

### LUNG ABSCESS

PERCY KLINGENSTEIN, M.D.

L. M., aged seventy-one years, entered Mount Sinai Hospital, service of Dr. Beer, in September, 1925, with a history of two weeks' pain in the angle of the jaw. Family, personal and previous history were irrelevant. Present illness dated back two weeks when patient began to cough and complained of pain at the left side of the mandible. Pain was aggravated by coughing and swallowing, and accompanied by some pyrexia and one chill. There was some expectoration, not fetid. The day before admission patient noted a swelling in the neck. Surgical status: Elderly man, appearing acutely ill, presenting a diffuse swelling in the anterior portion of the neck, extending from the suprasternal notch to the thyroid cartilage, which was felt to be displaced to the right. Over the left side of the neck, particularly anteriorly, there was a large tender edematous swelling in which deep fluctuation could be elicited. Aspiration yielded malodorous pus. Tempera-

ture 103.6°F. Preoperative diagnosis: Acute thyroiditis or mediastinitis, presenting in the suprasternal notch, possibly secondary to an esophageal perforation.

Under local anesthesia a large abscess located beneath the prethyroid muscles, containing about six ounces of pus, was evacuated and drained. The abscess extended downwards beneath the sternum and along the trachea, but further exploration was desisted from on account of the possible danger of breaking down adhesions or spreading infection along the cellular planes of the mediastinum, if this condition had not already existed. Pus from the abscess cavity contained on smear Gram-positive cocci in chains and Gram-negative bacilli which on culture yielded a *Morgan bacillus* (colon group).

The first roentgen-ray pictures showed what was suspected clinically: (1) a marked widening of the superior mediastinum in the region of the thyroid; (2) trachea displaced to the right and (3) a circular shadow  $1\frac{1}{2}$  in. in diameter in the lower portion of the left upper lobe which was unsuspected. Second roentgen-ray films six days later revealed the same shadow situated at the level of the fourth rib anteriorly and interpreted as an abscess. There were never any physical signs to make one suspicious of a pulmonary lesion. Aside from a slight unproductive cough, the patient had no symptoms accountable for the roentgen-ray finding. He was discharged to be observed.

About one week later he was readmitted with fever, cough, fetid expectoration hemoptysis, and high, remittent temperature. Chest signs were minimum. A roentgenogram showed a marked increase in size of the previously noted shadow which now extended from second to fifth rib anteriorly. There was also noted a fluid level. Accordingly, under local anesthesia, a resection of the fourth rib in the mid-axillary line was done. The pleura was entirely sealed off and a small rim of lung tissue was found to overlie an abscess cavity about the size of an orange containing foul pus. This cavity was lined with gangrenous pulmonary tissue. On straining, air could be seen to issue from numerous small bronchial openings. Drainage was established by rubber dam. The temperature came down to normal almost immediately; the pulse rate subsided gradually; the wound granulated well; the small bronchial opening closed gradually; and the patient was discharged four weeks

after operation with a granulating wound, which later closed completely.

Since that time he has been practically symptom-free. The wound has remained healed except during the period of an upper respiratory infection when the incision reopened and evidences of a bronchial fistula were present. The case is presented in an effort to obtain an opinion as to the sequence of events in this case. Did the pulmonary suppuration antedate the mediastinal infection or vice versa and what was their causal relationship?

(No discussion)

## FAT NECROSIS OF THE BREAST

PERCY KLINGENSTEIN, M.D.

B. J., female, aged thirty-eight years, was admitted to Mount Sinai Hospital, service of Dr. Berg, with a history that five weeks previously she first noted a lump in her right breast, unaccompanied by pain or discharge from the nipple. There was never any history of trauma. No increase in its size was noted. Both breasts were pendulous. Just above the areola of the right breast there could be palpated an irregular, finely nodular, firm, diffuse plum-sized mass, rather superficial but still appearing to take origin from breast tissue. It was adherent neither to the skin nor to the underlying structures. There was no nipple retraction or enlarged axillary gland. The mass was not easily definable but seemed rather to merge intimately with normal breast tissue. Preoperative diagnosis—carcinoma (?). Operation: Under general anesthesia a two-inch radial incision was made over the tumor mass, which was completely excised. Section showed it to consist of inflamed and necrotic masses of fatty tissue. Microscopical examination showed a typical fat necrosis.

I present this case not so much for its own interest, because both clinical and pathological aspects of fat necrosis of the breast have been adequately established by Lee and Adair, but rather in connection with the next case which presents another form of fat necrosis of important clinical significance.

(No discussion)

## PSEUDO-RECURRENCE AFTER RADICAL AMPUTATION OF BREAST FOR CARCINOMA

PERCY KLINGENSTEIN, M.D.

J. M., aged forty-seven years, entered the surgical service of Dr. Berg, Mount Sinai

Hospital, for a carcinoma of the left breast for which a radical mastectomy was done. Four months later she reentered the hospital because in the axillary portion of the wound just below the scar there was a rather hard nodule, partially adherent to the skin, about the size of a five-cent piece. It gave the impression of fluctuation and was not quite as characteristically hard as a recurrent carcinoma nodule. Impression: Pseudo-recurrence following radical mastectomy for carcinoma. Operation: Under local anesthesia a number of small intercommunicating cysts situated in the subcutaneous tissues and containing fluid of an oily consistency, were excised together with an elliptical skin area. Microscopical examination showed inflamed fatty subcutaneous tissue with cyst formation. The picture akin to, if not actually that of, fat necrosis, was produced, we believe, by operative trauma. We have now collected a series of these cases, four of which were published by Dr. A. V. Moschowitz<sup>1</sup> and called by him "Pseudo-Recurrence," and Dr. Zemansky<sup>2</sup> has included one in a recent article dealing with this subject. Just what element unabsorbed ligature material plays in the production of this pathological state is difficult to determine. In one section an unabsorbed ligature (catgut) is readily seen. It would seem as though both operative trauma and unabsorbed ligature material, might produce the lesion. Clinically these cases present difficult problems. These nodules are not quite as hard as carcinoma nodules, are tense or fluctuating and are usually quite tender. It taxes the diagnostic acumen of the surgeon to make a differential diagnosis. On the one hand, excision of a recurrent carcinoma may be fraught with the danger of spread of the disease; on the other hand, we should relieve ourselves of anxiety and the patient of an innocuous condition, should the lesion be a pseudo-recurrence.

(No discussion)

#### SARCOMA OF THE CALF MUSCLES IN A BOY AGED FOUR YEARS

PHILIP J. LIPSETT, M.D.

The patient, a boy aged four years, was brought to my department in the Good

<sup>1</sup> Moschowitz, A. V., Colp, R., and Klingenstein, P. Late results after amputation of breast for carcinoma. *Ann. Surg.*, 1926, lxxiv, 174-184.

<sup>2</sup> Zemansky, A. P., Jr., and Gottesman, J. Fat necrosis of heart. *Ann. Surg.*, March, 1927, lxxv, 438-449.

Samaritan Dispensary on January 3, 1927, for a painful swelling of the right calf. His previous and family history were irrelevant.

Present history: About two months before, about the middle of November 1926, he began to complain of pain in the right calf and the mother noticed the right calf getting larger. The child gradually lost his appetite, began to lose weight, grew weaker and by Christmas, unable to walk, he lay in bed. All this time complained of pain in the calf of such severity that he was unable to sleep.

The boy's physical examination was negative with the exception of the right lower extremity. The right calf was uniformly enlarged. The skin veins over the swelling were prominent. The swelling was painful, tender and tense. There was no induration. The mass was not adherent to the bones. The inguinal glands were palpable on the same side. Temperature 101°F. A tentative diagnosis was made of sarcoma or gunma of the soft tissues of the calf.

He was admitted to St. Mark's Hospital on my service for additional study.

Wassermann tests on mother and child were negative. The blood showed a moderate secondary anemia. Roentgenograms of the chest were negative. Roentgenograms of the right leg showed a uniform swelling of the soft tissues of the calf, the tibia and fibula giving normal shadows.

A final diagnosis of sarcoma of the calf muscles was made. Dr. B. T. Tilton was consulted. He concurred in the diagnosis and agreed that in view of the rapid growth of the tumor, and the palpable lymph nodes in the groin, the only therapy advisable was radiation. The child was discharged from the hospital and referred to the Radiation Therapy Department of Bellevue Hospital. The examining physician apparently disagreed with the diagnosis and the boy was admitted to the children's ward with a diagnosis of deep-seated infection of the right leg. Fortunately the attending surgeon did not agree. His diagnosis was also sarcoma. The child's leg was amputated above the knee within the next few days. The patient went into shock but rallied; and when I saw him a month later, he was markedly improved. During his stay at Bellevue, he received several injections of Coley's serum. Neither radium nor roentgen-rays were employed in this case. The glands in the groin were still palpable although one



could not definitely say that they were larger than before the operation.

The pathological report by Dr. D. Symonds, pathologist to Bellevue Hospital, was as follows: Tumor mass, well encapsulated, no connection with bone, but adherent to the periosteum of fibula. The tumor is soft. Microscopically, it is composed of spindle cells with some giant cells of the periosteal type.

This case presents the following interesting features:

1. It is that of a sarcoma of the soft tissues of the calf in a boy four years of age. The great majority of malignant tumors in children are of renal, ovarian or testicular origin.

2. The rapid growth of the tumor produced marked constitutional symptoms, so much so, that it was mistaken for an infection.

3. It ran the course of an infection,—general malaise, tenderness, pain and a temperature that varied between 99°F. and 101°F.

4. The question arises of proper therapy and the prognosis in these cases.

#### RECURRENT DISLOCATION OF THE SHOULDER TREATED BY CAPSULORRHAPHY AND TRANSPLANTATION OF THE DELTOID

(CLAIRMONT-EHRLICH OPERATION)

HENRY MILCH, M.D.

F. B., aged thirty years, was referred to me July, 1926 for treatment of a recurrent dislocation of the left shoulder. The first dislocation occurred during the winter of 1918, following a fall on the outstretched arm. This was reduced by his physician and the patient was able, in a short time, to resume his work without any impairment of function. In the winter of 1921, the patient again slipped and again suffered a dislocation which he was able to reduce himself. Since that time, he has had about one hundred dislocations of the shoulder. The effort of putting on his coat or any other action which involved abduction of the shoulder to more than 60 degrees, inevitably resulted in luxation of the head of the humerus. In other directions than abduction, the mobility of the joint was normal and there was no evidence of any arthritic changes. There was no loss of power or sensation in the arm and the only limitation to normal function was the patient's fear of dislocation. A roentgenogram of the shoulder showed signs of an

old injury, probably a fracture of the glenoid fossa.

I was somewhat timorous about trusting the final result to a capsular reefing or to the "tenosuspension" originally described by Joseph and subsequently modified and reported upon by Henderson. I believed that by both of these methods, the hope of cure was being placed on a structure which in itself was subject to stretching and consequent relaxation. It was felt that it would be much more logical and physiological to oppose against the tendency toward redislocation, an actively contracting muscle wound around the neck of the humerus and acting in the nature of a sling. This principle is employed in the Clairmont-Ehrlich operation. In this operation, the posterior third of the deltoid is utilized with the idea of supplying a force which shall actively support the head of the humerus and hold it in place at the very same moment and even in the very same degree that the rest of the muscle acting through its insertion into the deltoid tubercle tends to cause abduction of the arm with consequent downward displacement of the head.

To overlook nothing that might lead to the successful outcome of the operation, it was decided to combine this procedure with the time-honored capsulorrhaphy. Through a long anterior incision, extending from the coracoid process, the capsule was exposed and, after tenotomy of the coracobrachialis, was plicated both in the horizontal and longitudinal directions. The capsule was found thickened by scar tissue but showed no sign of any rent. Through a posterior incision, extending from the acromion process to the deltoid tubercle, the posterior third of the deltoid muscle was dissected free and passed through the quadrilateral space to the anterior incision. The slack in this transplant was taken up and the end of the muscle sutured as high up on the body of the deltoid as possible. Because of the shortness of the transplant, it was impossible to attach its end to the acromion process where, ideally, it should have been inserted. The fascial and skin wounds were closed in the usual manner and the patient was dressed with the arm in adduction. Apart from a slight slough in the anterior wound, an uneventful recovery followed. At the end of four weeks, the patient was permitted gradually to abduct the arm. In the beginning, he complained of an annoying sense of tightness

under the arm, but this gradually diminished and at the end of about two months, he was able, freely and forcefully to abduct his arm to about 150 degrees. At the present time, nine months after operation, the sense of weakness and the feeling of insecurity of which the patient complained previously has completely disappeared and he is able to use his arm for all his normal activities. He has observed, however, that in wide abduction of the arm he still has a slight sense of tightness in the axilla. This, of course, is due to the sling-like action of the transplanted portion of the deltoid.

(No discussion)

#### CICATRICAL CONTRACTURE OF AXILLA AND ELBOW FOLLOWING BURN. TREATED BY PLASTIC REPAIR OF THE ELBOW WITH RECONSTRUCTION OF THE AXILLA

HENRY MILCH, M.D.

V. L. colored, aged eleven years, was admitted to the Hospital for Bone and Joint Diseases, July 12, 1926, with history of having suffered a severe third degree burn of the right side of the body in October, 1924. The burned area included the right chest wall and abdomen down to the level of the umbilicus and the inner side of the right arm as far down as the wrist. The axilla in particular was badly burned. The wounds were treated by a physician in South Carolina by application of wet dressings. The arm was, unfortunately, bandaged to the side with the elbow in 90 degree flexion so that at the expiration of the treatment, the elbow could not be extended and the arm was firmly adherent to the chest wall midway to the umbilicus. The axilla was, of course, completely obliterated.

In February, 1925, several attempts were made at one of this city's hospitals to release both shoulder and elbow. These efforts were not very successful and the patient was admitted to the hospital in the condition shown in Fig. 1. The elbow could be flexed but could not be extended beyond 90°. There was only about 45° of abduction at the shoulder, motion being markedly restricted by a firm web of scar tissue which obliterated the axilla and bound the arm down to the chest wall over more than one-third of its length.

Because of the severity of the operative procedures to be undertaken, it was decided

to divide these into two stages. In the first operation performed on July 15, a large anterior skin flap with its base on the chest wall and its free edge along the anterior surface of the arm, and another similar flap with its base on the posterior surface of the arm and its free edge on the posterior chest wall, were outlined and raised. The scar tissue in the axilla was completely dissected away, permitting wide abduction. The anterior flap was turned behind and sutured to the chest wall into the area left free by the raising of the posterior flap. The posterior flap was turned anteriorly around the humerus. The flaps were sutured together along their free upper margins high in the axilla, thus forming a new axillary pit. The defect remaining on the posterior wall was obliterated by undermining and shifting a large skin flap from the vertebral region. The arm was put up in wide abduction in a plaster cast. At the end of two weeks, the sutures were removed and several necrotic areas in the angles were excised. These were later covered by pinch grafts and Thiersch grafts. At the end of four weeks, the patient was able actively to abduct the shoulder to about 120 degrees, and by exercise this was gradually increased to about 160 degrees.

On September 16, 1926, the scar in the elbow region was resected, by means of a long Z-shaped incision for the better mobilization of the skin flaps. Because of the wide resection of skin, there was some difficulty in approximating the edges even after extensive undermining and the making of counter-incisions. A posterior molded splint was applied for the purpose of maintaining extension. This, however, proved not feasible and the patient was allowed out of bed with five pounds of traction weights to overcome the contracture of the biceps and the brachialis anticus. When traction was removed, the wounds were almost healed and the child was able to abduct the arm to about 160 degrees and to extend the elbow to about 150 degrees (Fig. 2). At this time, he was sent to the physiotherapeutic department for such exercises as chinning and weight-carrying, designed to increase the range of motion both at the elbow and the shoulder. Shortly after this, he disappeared from our clinic, but I have since heard from him at his home in Carolina, that he has made a complete recovery.

The problems to be solved in the restoration of these two scarred areas are of interest

because they may be looked upon as illustrating the fundamental principles of two different types of skin plastics. In the treatment of the shoulder reconstruction, the problem appeared to be similar to that presented by web finger. In each, the problem consists in the dissevering of members normally separate which are found adherent in a parallel position. The treatment undertaken consequently consisted in the application of the two-flap operation suggested by Didot for the cure of

single Z-shaped incision with excision of the scar proved somewhat inadequate as it left the tissue under great tension. In thinking about this case subsequently, it occurred to me that an incision which would in outline represent either the line made by a continuous mattress suture or better still an incision line represented by the sine curve, might possibly have given better results and left the tissue under much less tension.

(No Discussion)



FIG. 1.

web finger. This operative principle can be employed in all cases, whether in mucous membrane or in skin, where the parts lying in parallel position are held together by a scar tissue bridge covered on both sides by broad areas of skin or mucous membrane.

In the treatment of the elbow, as indeed in other similar contractures, as for example those about the neck, the knee, etc., the problem consists essentially in providing skin in a longitudinal direction which has been obtained at the expense of the excess of lateral skin. For this purpose, the making of a Z-shaped incision is ideal. In the treatment of flexion contractures of the fingers, Morestin advocated what in essence is the making of a series of Z-shaped incisions continuous with one another. In a contracture as extensive as the one which we had here to treat, the simple,



FIG. 2.

I. EXTENSIVE SQUAMOUS-CELL EPITHELIOMA OF THE HAND OF FIVE YEARS' DURATION. EXTENSIVE SQUAMOUS-CELL EPITHELIOMA OF LIP. LARGE MALIGNANT TUMOR OF CHEEK OF THREE YEARS' DURATION

GEORGE A. WYETH, M.D.

CASE 1. W. McL., male, aged fifty-eight years, when a boy of eleven had dropped a little hot tar on his left hand near the base of the thumb. The result was a severe burn which in time became ulcerated and spread until it was as large as a twenty-five cent piece. For

more than two and one-half years this persisted despite the use of various ointments. Then its character changed and it became a mass of small seed-like growths. These spread across the hand to the little finger, and on the upper arm appeared deep-seated boils which resisted many months treatment, finally clearing up to leave deep scars. Again when the patient was twenty-two years old, the entire arm became inflamed on all surfaces, only the palm of the hand being relatively free from the eruption. Finally the ring finger became so enlarged it was necessary to amputate it.

In all this time there were varying diagnoses: erysipelas, elephantiasis, tuberculosis, warts, and syphilis. About four years before the patient came to me a small wart had appeared on the index finger, where it grew rapidly. In September, 1920, a diagnosis of epithelioma was made and roentgen-ray treatment was instituted. In April, 1921, after an enforced absence of some weeks from the city, the patient came under my care at Vanderbilt Clinic. The lesion then measured about  $3\frac{1}{2}$  inches in length by 2 inches in width, with an elevation of from  $1\frac{1}{4}$  to  $1\frac{1}{2}$  inches. Wassermann reaction negative. The patient had repeatedly been advised to have his arm amputated at the shoulder. It was decided to employ bipolar endothermy before resorting to the extreme measure of amputation.

Under anesthesia the malignant area was isolated from the surrounding healthy tissue and the lesion was coagulated in situ, cut out and curetted down to a healthy base.

On January 17, 1927, patient states that about three months ago while at work he struck his elbow on a door, shortly after which it broke down and has been ulcerated ever since. Directly over the elbow is an open lesion 5 cm. by 2 cm. with elevated pearly edges. It was treated with bipolar endothermy January 22, 1927 and is healing nicely.

Pathologist report: Squamous-cell epithelioma (grade 3).

CASE II. M. W., male, aged fifty-two years, had an extensive squamous-cell epithelioma of the lower lip (grade 2). About a year ago he noted a pimple on the lower lip, which broke down and began to spread. This increased in size despite various treatments. Patient stated that within the preceding two weeks it had increased rapidly and he was "going down hill."

The lesion involved the whole lower lip,

down to the sulcus in the chin. It was a crater-like epitheliomatous growth which had already perforated, saliva going through the opening. On the left side one submaxillary nodule was rather markedly enlarged and somewhat fixed. On the right side there were three submaxillary enlargements, but all freely movable.

The patient was operated upon October 30, 1925 under anesthesia. The entire lesion was surrounded and destroyed by bipolar endothermy, and excised with the endotherm knife.

The lower lip filled in quickly except for a granulating area on the mucous membrane about 3 by 2 cm. below the teeth. Nodules on the right side of the neck and the submaxillary gland on the left side were completely reduced. The patient was given roentgen-ray treatment to both sides of the neck and referred to Dr. J. Eastman Sheehan for a plastic operation.

Two weeks after plastic operation, March 12, 1926, the patient had marked recurrence in all lines of the scalpel's incision, particularly at the angle of mouth. Again treated by bipolar endothermy March 26, 1926. No evidence of recurrence since.

CASE III. A. G., a Pole, aged fifty-eight years, was admitted to the Third Surgical Division of Bellevue Hospital, March 4, 1924. At the request of Dr. George D. Stewart I removed the growth by endothermy on March 13.

According to the patient's report, the growth had begun some three years before as a sore inside the cheek, opposite the right bicuspid. It remained small for a year and then began to grow. During the six months preceding her arrival at Bellevue it had grown very rapidly and at the time I saw her the mass was the size of a large orange. There was no pain or tenderness but at intervals the tissue would bleed and parts of it would fall away. It involved the right cheek and upper lip, mainly to the right of the midline. The skin was tense and shiny and there were three spots of ulceration. Dilated veins were seen at the upper and lateral aspects of the mass. Externally the growth extended from 4 cm. anterior to the angle of the mandible on the right side around to the point opposite to the first incisor tooth on the left side. Interiorly it extended from the last molar to the midline and there was seen a deep crater-form ulceration which extended to the upper lip. The mass was lobulated and tense. Freely movable, it raised

the right ala of the nostril and seemed to involve the tissues of the upper lip and cheek only. There were a few palpable lymph glands on both sides of the neck, more on the right.

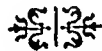
Under ether narcosis, the growth was isolated from the surrounding healthy tissue by a path of coagulation necrosis, at its base only, by the technique of bipolar endothermy. Lymphatics, blood vessels and sensory nerves having been thus seared off, the endotherm knife was brought into use. This quickly excised the tumor without hemorrhage. Convalescence was rapid, there being, as usual, no secondary reaction and no evidence of surgical shock. The patient was able to take food well, the wound sloughed without interference and granulation and filling in of the excised tissue took place. The wound healed in four weeks. One month later plastic operation was performed by Dr. Arthur M. Wright.

Dr. Symmers' report: The histology is slightly

suggestive of adamantinoma and were the tumor located in the bone I should have no hesitancy in making a positive diagnosis of adamantinoma. The fact that the tumor was removed from the soft tissue in the vicinity of the lip, however, renders this diagnosis highly problematical, although one cannot entirely overlook the possibility of an adamantinoma of the soft tissues springing from congenitally misplaced enameloblasts. It is possible that the tumor represents a metastatic growth which has so changed its morphology as to resemble an adamantinoma.

The diagnosis of spindle-cell sarcoma must also be taken into consideration, although close inspection of the cells leaves the impression that they are epithelial and that the tumor belongs in the group of epitheliomata. There are so many possibilities to be taken into consideration that a positive diagnosis, in my opinion at least, is not justified.

(No discussion)



## GAUZE VS. RUBBER DRAINS IN CLEAN WOUNDS

**B**ECAUSE wound secretions coagulate in its meshes and wound surfaces become adherent to it, many surgeons have abandoned gauze as a drainage material and employ only rubber or other smooth material instead. It must be admitted, however, that a rubber drain often unduly prolongs the escape of secretions from a wound which might well have healed per primam if closed without any drainage; and often, too, the drain is thus contributory to a wound infection which it was designed to prevent. Contrary to the practice of many, one of our editors employs gauze as a drain for *clean* wounds, for reasons which he gives in the following brief communication:

### RUBBER DRAINS UNDESIRABLE IN CLEAN WOUNDS

The universal employment of some form of rubber as a drain, when used to transmit the contents of a hollow viscus to the surface, such as the biliary and urinary bladders, is warranted. Likewise when there is a cavity to be emptied, such as a pelvic or pleural abscess, it is desirable.

In draining recent clean wounds of secretions likely to occur after the completion of the operation, it is theoretically and practically wrong. Rubber prevents coagulation of the secretions as they pour into a fresh wound; consequently secretions continue to pour in. The coagulation of the exudate into the wound is the initial process in wound healing and this preliminary process is prevented by the rubber drain. Therefore healing is delayed. This uncoagulated exudate is an optimal

culture medium, therefore infection is invited.

The old surgeons knew that it was the failure of healing to take place about the ends of ligated vessels that brought about secondary hemorrhage. Rubber likewise hinders healing and in that measure invites late hemorrhage. This is particularly important when operating on vascular tissue as in goiter operations. Therefore if secretion is likely to form in a clean wound, gauze is the proper drain. This substance encourages coagulation and so limits the secretion and furthers the progress of healing. Many do not like gauze drains because they stick to the wounds, which makes them difficult to remove. But this very adherence proves that the gauze drains promote healing.

The facts above noted can be verified by placing a pledget of gauze in one part of an animal's abdomen and a wad of rubber tissue in another. The gauze will be found covered by adhesions in a few days, while the rubber tissue will be lying loose in an exudate. Therefore, if one desires a wound to heal, drain with gauze. If one wants to prevent healing, use rubber.

ARTHUR E. HERTZLER.

### A CIVIC SERVICE

In the advertising section of this issue of the JOURNAL will be found the announcement of the Post Office Department concerning a confirmed criminal who is wanted for the murder of a letter carrier. Because this man has an active rectal ailment it is believed that he will apply for treatment to physicians or hospitals, who are requested to be on the look-out for him.



## BOOK REVIEWS

**SOUTH AMERICA.** Amplified to Include all of Latin America; The Vandyck Cruise. By Franklin H. Martin, C.M.G., D.S.M., M.D., LL.D., F.A.C.S., Director-General, Am. Coll. Surg.; Editor, Surg., Gynec. & Obst.; Pres. Gorgas Memorial Institute of Tropical and Preventive Medicine, Inc. Revised Ed. 8vo. Cloth. \$3. Pp. 435; illus. N. Y. Fleming H. Revell Co., 1927.

Dr. Martin has placed American surgery in his debt for his years of service as an editor and an organizer.

With this fascinating volume of medical travels in Latin America he has mortgaged another continent and a half.

An ambassador of friendship and understanding, he has opened to his confrères and others an interesting invitation to visit our sister republics, or to learn through his eyes to appreciate South American contributions to our art.

This book should be a corrective of the provincial viewpoint which frequently develops in our schools. It is refreshing to learn of the great possibilities in the lands of the other hemisphere.

**SURGICAL ANATOMY OF THE HUMAN BODY.** By John B. Deaver, M.D., Sc.D., LL.D., F.A.C.S., Surgeon-in-Chief, Lankenau Hosp., Philadelphia; Emer. Prof. of Surgery, Univ. Penn. Ed. 2. 3 vols. 8vo. Fabricoid. \$36. Vol. II. Pp. 854; 195 pl. Vol. III. Pp. 763; 159 pl. Phila. P. Blakiston's Son & Co., 1927.

Surveying the first volume of the handsome second edition of this most important of Deaver's valuable treatises (the *JOURNAL*, August, 1926) we described its character and its arrangement. The second volume (Upper Extremities, Neck, Shoulders, Back, Lower Extremities) and the third (Joints of the Lower Extremities, Chest, Thorax, Abdomen, Perineum) are no less attractive than the first and indicate the same thorough revision, textual and pictorial. The descriptions are precise and and are well balanced from the standpoints of anatomic accuracy and surgical significance. They include considerations of various pathologic conditions (e.g., dislocations, talipes, hallux valgus) and certain operations (e.g.,

ligations of vessels, amputations). The illustrations, profuse and many of them new, are from original dissections.

**1926 COLLECTED PAPERS OF THE MAYO CLINIC AND THE MAYO FOUNDATION.** Ed. by M. H. Mellish, H. Burton Logie, M.D., and Charlotte E. Eigenmann, B.A. 8vo. Cloth, \$13. Pp. 1329; 386 illus. Phila., W. B. Saunders Co., 1927.

Since the "collected papers" of the Mayo Clinic and those of the Mayo Foundation, each a rich literary output every year, have been combined in a single annual volume, it has been necessary to condense some of the reprinted articles and to publish others in brief abstract or even by title only. This has been done, however, only for the more theoretical or purely research papers. The 1926 publications of practical medical and surgical interest have been here reproduced in full. The papers are appropriately grouped and adequately indexed.

**A TEXT-BOOK OF PATHOLOGY.** By Alfred Stengel, M.D., Sc.D., Prof. Med., Univ. Penn., and Herbert Fox, M.D., Prof. Compar. Pathol. Ed. 8. 8vo. Cloth \$10. Pp. 1138; 552 illus.; 18 col. pls. Phila., W. B. Saunders Co., 1927.

Stengel's Pathology has been before the profession about thirty years and in this edition it therefore scarce needs review. Despite much revision its form has not been changed. The authors have striven to continue it as a textbook for students and practitioners in which essential facts of morbid anatomy and physiology and of etiology are presented in paragraphic form, conservatively, without too great detail.

**DIE CHIRURGISCHE BEHANDLUNG DER GEHIRNTUMOREN.** Eine klinische Studie. By Dr. Herbert Olivecrona, Privatdozent Oberarzt an der chirurgischen Universitätsklinik im Scaphimerkrankenhaus, Stockholm. In collaboration with Dr. E. Lyschelm, Chefarzt der Röntgenabteilung des Krankenhauses, Mörby, Stockholm. 8vo. Pp. 344; 228 illus. Berlin: Julius Springer, 1927.

To consider in a volume of 340 pages the diagnosis and surgical treatment of tumors of the brain is a daring effort, but the author has



given us a very readable account of his personal experiences. Dr. Olivecrona is evidently thoroughly conversant with the literature of the subject and follows, in many features, the principles of cranial surgery laid down by Cushing and the American school of neurosurgeons.

The histories of a large number of cases are given in detail with comments on each case, and with excellent illustrations of the tumors removed at operation and of the brains removed at post-mortem examination in the fatal cases.

Separate chapters are devoted to the gliomas, to the meningiomas, acoustic nerve and hypophyseal duct tumors, to the tuberculomas, the angiomas and to metastatic growths.

A special chapter on roentgen-ray diagnosis of tumors of the brain and the technique followed by Lysholm and Olivecrona, although it contains nothing new, is quite interesting, as are the author's experiences with ventriculography, ventricular estimation, and exploratory brain puncture. There were 2 fatalities after air injection into the ventricles among 14 cases in which this diagnostic procedure was used. Both patients died in coma within twenty-four

hours of the air injection. There were no fatalities when the air was injected by the lumbar route.

The chapters devoted to indications for operative interference and to operative technique present no new facts but are good summaries of the subjects, with many references to the views of other writers.

The concluding chapter on operative results, —both those obtained by others and those in the author's series—is a complete statement of what has been accomplished by those who have frankly published their full results. The author is one of those who reports all of his results, not only those that have been successful. For this he deserves the fullest credit, for the development of surgery of brain tumors has been not a little hindered by incomplete reports of the results obtained.

In summary, the monograph of Olivecrona is valuable for its frank discussion of the problems and the difficulties encountered in this new branch of surgery, and for the valuable and instructive histories of many of the author's cases. The volume should be on the shelf of every neurosurgeon.—C. A. ELSBERG



Subscribers to THE AMERICAN JOURNAL OF SURGERY visiting New York City are invited to make the office of the publishers (Paul B. Hoeber, Inc., 76 Fifth Avenue, New York) their headquarters. Mail, packages or bundles may be addressed in our care. Hotel reservations will gladly be made for those advising us in advance; kindly notify us in detail as to requirements and prices. List of operations in New York hospitals on file in our office daily.

# PROGRESS IN SURGERY

*Selections from Recent Literature*

BREBNER, I. W. Head injuries and their treatment. *J. M. A. South Africa*, June 11, 1927, i, 281.

Brebner expresses the following opinions:

1. All cases of intracranial hemorrhage should be operated upon.

2. All lacerated scalp wounds should be operated upon and the underlying skull investigated.

3. Continued high blood-pressure, especially if associated with continued high cerebrospinal fluid pressure, is a strong indication for operation.

4. Cases showing mental symptoms some time after the injury should be decompressed.

5. Very few cases of edema pure and simple require operation, and then only when associated with a high blood-pressure.

6. Extensive laceration of the brain offers very little hope of successful operative interference.

7. Dilated and fixed pupils are a definite contraindication to operation.

8. High pressure of the spinal fluid is of greater value than high blood-pressure as an indication for operation.

9. Increase in temperature is a bad omen, more especially of the rise is sudden and continues for more than forty-eight hours.

ROCKEY, E. W., Portland, Oregon. Value of radiographic contrast solutions in the study of brain abscess. *Ann. Surg.*, July, 1927, lxxxvi, 22.

A case is reported to illustrate the value of sodium iodide roentgenographs.

BUNNELL, STERLING, San Francisco. Suture of the facial nerve within the temporal bone; with a report of the first successful case. *Surg. Gynec. & Obst.*, July, 1927, xlv, 7.

Bunnell reports a case in which he performed the difficult and delicate operation of reuniting by suture within its bony canal a facial nerve that had been divided at a mastoid operation four months previously, and on the proximal end of which there had formed a neuroma that had to be removed to effect regeneration. A cure resulted—the first successful operation

of the kind to be recorded. Bunnell, who has shown the feasibility and desirability of reuniting divided nerves in the hand and fingers, advises that one should not attempt this operation without practicing the suture of small nerves in a piece of meat. The fine stitches are all passed through the sheath only. The exposure of the nerve must be very carefully done, of course; it lies deep below the skin and a very fine curved needle is necessary for the work within the canal. Bunnell chiselled away the vaginal process of bone at the stylomastoid foramen in order, by shortening its course, to approximate the nerve after cutting away the neuroma and a little of the distal end. This end was adherent in the canal and needed to be freed with a fine probe. The branches to the stylohyoid and posterior belly of the digastric, which were also holding it, were deliberately divided. The posterior wall of the facial canal was chiselled away to the level of the nerve to facilitate the needle work. Adrenalin and wax were used to secure a dry field.

BERGAMINI, H. and SHEPARD, L. A., New York. Bilateral atelectasis (massive collapse) of lung. *Ann. Surg.*, July, 1927, lxxxvi, 35.

Postoperative atelectasis, or massive collapse, is usually a benign, unilateral condition, occurring from a few hours to a few days after operation. The collapse may, however, be bilateral and may occur at, or immediately after operation, and cause sudden death.

The extreme rapidity of onset of such cases tends to disprove the obstructive theory of the etiology of the condition.

There was no evidence of gross obstruction of the bronchi of the collapsed lungs at necropsy.

The histological appearance of these lungs strongly suggests that the cause of the atelectasis may be a vasomotor disturbance of reflex origin, possibly identical with or closely akin to angioneurotic edema.

HARRIS, F. I., San Francisco. Non-inversion of the appendix stump. *California & West. Med.*, July, 1927, xxvii, 69.

The inversion methods of treating the appen-

## Progress in Surgery

dix stump are dangerous, unsurgical, and unnecessary for the following reasons:

1. There is danger of abscess formation in the wall of the cecum.
2. In the true inversion method there is danger of secondary hemorrhage from the unligated appendicular artery.
3. These methods are not applicable to every case, require more time and offer greater technical difficulties.
4. They are largely responsible for the post-operative appendectomy adhesions and probably give a greater incidence of fecal fistulae.
5. They are the cause of remote complications such as inflammatory tumors of the cecum and diverticula.

On the other hand, non-inversion offers a method to which none of these objections can be made, and in addition it is undeniably simple, time-saving, and adaptable to practically all cases.

CLIFTON, H. C., and LANDRY, B. B. Fibromata of the intestines. Report of a case and review of the literature. *Boston M. & S. J.*, July 7, 1927, cxvii, 8.

Forty-five cases of fibromata of the intestine were found in the literature, of which forty were encountered at operation and five at autopsy. The majority were found in the small intestines.

These tumors most commonly assert themselves by bringing about intussusception. Evidence is produced to show that intussusception results from reaction of the bowel to what is virtually a foreign body. Sometimes reduction of the intussusception and enterotomy will be sufficient. This is perhaps the ideal way, but often, because of the thickening, edema and inflammation of the bowel and doubt as to its viability if replaced within the abdomen, this course cannot be followed. In one case (Bevan) an enterotomy was done and the tumor removed, following which the intussusception was reduced. Resection will be more commonly indicated. The tumors when sectioned are often inflamed and infiltrated and at times enlarged glands are found in the mesentery. In any case where there is doubt as to the benignity of the tumor or when enlarged glands are present, resection is the only rational procedure. However, bearing in mind that benign tumors of the small bowel outnumber malignant tumors more than two to one and enlarged glands being absent, it is equally rational, if the intussusception is

reducible, to do a simple enterotomy and then if gross characteristics of the tumor further indicate it as benign, to excise the tumor and pedicle. Often the intussusception is irreducible and there is no recourse except to resection.

GIBSON, T. E., San Francisco. Diagnosis of adrenal tumors with classification of adrenal tumor syndromes, and report of cases. *J. Urol.*, July, 1927, xviii, 33.

Adrenal tumors in general produce three distinct syndromes, (1) the genitosuprarenal, (2) the Hutchison, and (3) the Pepper.

Cortical tumors of the adrenal (carcinoma) produce characteristic changes in the sexual sphere, namely, the so-called "genitosuprarenal syndrome." These are in a word, virilism or pseudohermaphroditism in the female, and precocious puberty in the male. The changes in both sexes are toward the adult male type. Cortical tumors in the adult male, therefore, exhibit no clinical features of diagnostic importance in the sexual sphere. Benign hyperplasia and adenoma formation in the adrenal cortex may give rise to the same syndrome.

Cortical tumors may occur at any age. They appear to be as frequent in infancy as in the adult, and are more frequent in the female. Pigmentation of the skin and mucous membranes occurs in cortical tumors in not over 3 per cent of cases. It does not occur in medullary tumors.

Hypertension appears to be a fairly constant symptom of cortical tumor, particularly in young subjects, and is therefore of some diagnostic value.

The common tumor of the adrenal medulla is the neurocytoma, or "sarcoma." It occurs almost exclusively in infancy and childhood.

Two types of neurocytomata are distinguished:

The Hutchison type is characterized by early metastasis to the orbit, usually to the side on which the primary tumor is located, producing unilateral exophthalmus, or proptosis of the eyeball. In many instances the primary tumor has remained undiscovered until autopsy.

The Pepper type of neurocytoma is characterized by rapid enlargement of the abdomen, due to metastasis to the liver. The liver reaches enormous proportions, although the primary tumor may remain small, and there are generally no other metastases.

The prognosis is malignant tumors of the adrenal is almost invariably bad, because of the

frequency with which metastatic phenomena are the first symptoms of the disease. This is true particularly of medullary tumors. Occasional cures are reported in cortical tumors. The course of adrenal malignancy is extremely rapid.

The treatment of adrenal tumors is surgical and radiological. Although usually hopeless, operative interference is indicated in the hope of finding a benign growth or cyst, or of removing a malignant tumor before metastasis has occurred. If surgery is contraindicated, deep roentgen-ray therapy deserves a trial.

Urological investigation is indicated as a preliminary to any operative procedure, not only as a diagnostic measure, but to determine relative renal function as it is very often necessary to remove a kidney with the tumor mass.

In a series of 46,265 admissions to the University of California Hospital, there have been but 4 cases of proved primary adrenal tumors. Two were cortical and 2 cases medullary in origin. Five other cases are analyzed, in 3 of which there were metastases to the adrenal from some other source, and in 2 diagnosed adrenal tumor but the diagnosis was never confirmed. Metastasis to the adrenal from tumors elsewhere in the body may produce the cortical syndrome and in some cases an Addisonian syndrome.

SMITH, K., Kansas City. The clinical significance of ureteral obstruction. *Kansas City Clin. Soc. Montb. Bull.*, July, 1927, iii, 27.

Smith believes that ureteral obstruction, far from being a rare pathological curiosity, is an extremely common cause of abdominal pain. When situated near the bladder, it is productive of much bladder disturbance. It is directly responsible for urinary stasis, which together with intestinal stasis, probably of reflex nerve origin, results in toxic retention with headache, general debility, etc. In women, when situated in the broad ligament region, its correlation with the pelvic organs is productive of backache and dysmenorrhea.

Careful history taking and study of the clinical symptoms, together with painstaking examination, should be the basis for diagnosis. The two expected features of the clinical picture, pyuria and bladder disturbance, are very often absent. Cystoscopic and roentgen-ray procedures are but methods of proving or disproving the digest of the clinical picture.

CARSON, W. J., Milwaukee. Dilatation of the ureter in the female. Autopsy findings. *J. Urol.*, July, 1927, xviii, 31.

In 115 consecutive autopsies on females, ureteral dilatation was found in 31 cases (37 per cent) bilateral 18; right 11; left 2.

Forty-nine ureters were found dilated in 31 females with the kidney pelvis above dilated in forty-six instances.

Pregnancy is the most frequent cause of ureteral dilatation in women.

Ureteral stricture, inflammatory in origin were found in 4 cases, bilateral 1.

A congenital ureteral stricture, right side, is reported.

DEMING, C. L., New Haven. Primary carcinoma of diverticulum of the bladder. *J. Urol.*, July, 1927, xviii, 73.

Primary carcinoma of a diverticulum of the bladder is a rare condition. So far 10 cases have been reported with 9 deaths. All were males, 8 of whom were in the seventh decade. Intermittent hematuria with obstruction and signs of urinary infection are the outspoken symptoms. A majority of the tumors were of a papillary nature. The etiology is as obscure as is the etiology of tumors of the bladder in general.

MARSHALL, V. F., and REED, C. C., Appleton, Wis. Reduction of cervical dislocation. *J. Am. M. Ass.*, July 16, 1927, lxxxix, 191.

Marshall and Reed recommend the method of Walton. The essentials of Walton's plan of reduction are: (1) dispensing entirely with extension, and (2) using only retrolateral flexion and rotation. The proper method is simply to raise the depressed process and rotate. This can be accomplished only by extending the head obliquely backward toward the right or left as the case may be and using the transverse process on the same side as a fulcrum. The ligaments which have held the vertebra firmly in its faulty position do not offer opposition to this movement, so that force is not required first to elevate in this way and then to rotate to the proper position. The patient should be thoroughly anesthetized (nitrous oxide), and should be in the sitting position. This gives freedom of movement and prevents confusion of the proper movements of reduction.

## Progress in Surgery

JOHNSON, R. W., Baltimore. A study of the healing processes in injuries to the carpal scaphoid. *J. Bone & Joint Surg.*, July, 1927, ix, 482.

Bone repair takes place in the scaphoid in exactly the same manner as in the medulla of the diaphyses, but the process is not as active or extensive. There is no interference with vascularity of the fragments of a fractured scaphoid which would cause necrosis or interference with hyperemia and secondary delayed union or non-union.

In these experiments approximation of fragments is so close that mobility or displacement played no part in retarding union. No lytic action of synovial fluid is observed. Lack of all periosteal callus is a large factor in causing slower fusion of fragments into a solid mass.

Fractured hyaline cartilage heals by fibrous tissue, and adjacent but undamaged hyaline cartilage also often undergoes vascularization and fibrous change. This gives rise to permanent changes of the articulating surfaces and is probably the element most responsible for bad functional results seen clinically in these fractures.

All bones of this cancellous type heal more slowly than the long bones. This is due largely to the lack of subperiosteal callus formation, but is also due in part to the cancellous reaction being less extensive and less active than is the medullary response in the diaphysis.

MAYER, L., New York. Transplantation of the trapezius for paralysis of the abductors of the arm. *J. Bone & Joint Surg.*, July, 1927, ix, 412.

Mayer reports a method of substituting the trapezius for paralyzed arm abductors, in which he employs fascia lata to lengthen the muscle instead of Lange's silk strands. The fascia is sutured to the cut edge of the muscle, tubulized and brought down through a cut in the acromion process and a tunnel made in the humerus.

Essential to success of the procedure is the presence not only of a strong trapezius and serratus magnus, but also of one additional muscle, either the clavicular portion of the pectoralis major, the biceps, or the coracobrachialis. The operation has the advantage over arthrodesis that it gives a more complete range of abduction and the esthetic effect is more pleasing. It has the disadvantage of

requiring at least three months of postoperative exercises. Mayer has done this on 6 patients.

MORTON, D. J., New Haven. Metatarsus ataviens. The identification of a distinctive type of foot disorder. *J. Bone & Joint Surg.*, July, 1927, ix, 531.

A painful disorder of the anterior portion of the foot, for which the term "metatarsus ataviens" seems to be most applicable, presents two characteristic signs which warrant its recognition as a definite clinical entity. The first of these characteristic signs is a morphological one, manifested in the unusual shortness of the first metatarsal bone, as compared with the length of the second. The other is the clinical symptom of tenderness elicited by deep pressure on the sole of the foot in the region of the second metatarsocuneiform joint.

Identification of this type of disorder facilitates the recognition and treatment of what appears to be a very large group of painful foot cases. Although in its range of subjective symptoms the present condition simulates other metatarsal disorders, the means of diagnosis and the elements of treatment are distinctive and specific.

The intensity of symptoms is not determined by the degree of disproportion in the length of the first and second metatarsal bones alone, but to an equal degree by the violence and distribution of the strains and stresses to which the foot is subjected. Hence, an adult foot with only a mild shortening of the first metatarsal bone, but which is subjected to frequent severe strains or prolonged periods of standing, is more likely to present disabling symptoms than one with greater inequality in the length of the bones, but which is not subject to heavy or vicious usage.

The early part of the treatment consists of eliminating the effects of chronic traumatic irritation. When this has been accomplished, conditions have been restored which characterized the efficient and painless state of this type of foot prior to the onset of symptoms. Subsequent care does not seem to require more than the use of conservative measures in order to maintain that symptomless state.

COOPERMAN, M. B., Philadelphia. Gonococcus arthritis in infancy. A clinical study of forty-four cases. *Am. J. Dis. Child.*, June, 1927, xxxiii, 932.

Periodic examinations of hospital help and routine bacteriologic studies of cervical and vaginal smears of expectant mothers before admission to maternity hospitals are prophylactic measures in eliminating these as possible sources of gonorrhea.

The importance of an early diagnosis of gonococcus sepsis in the newborn housed in hospitals cannot be too strongly emphasized. The disease once introduced into such institutions spreads with incredible rapidity, infecting all newborn infants who are exceedingly susceptible to the infection. Such prodromal symptoms as mild elevations of temperature, skin eruptions, superficial abscesses and swelling of the joints should make one suspect the presence of gonorrhea, the diagnosis of which can be made in the early stages by rectal and vaginal smears and bacteriologic studies of joint exudates.

The rectum is a portal of entry for gonococci that hitherto has not been sufficiently stressed. The organisms invade the blood stream shortly after the initial local implantation and rapidly metastasize to predisposed joints.

Two forms of gonococcus arthritis are observed in infancy, one accompanied by a great deal of swelling and tenderness suggesting suppuration and the other, a subacute synovitis with effusion. Multiple arthritis is the rule in 75 per cent of the cases.

Infantile joints, because of their cartilagenous nature, display a marked resistance to the infection. Suppuration of the joints exceedingly damaging to the adult articulations and producing terminal ankyloses was not observed as sequelae in any of the cases.

Gonococci may invade the medullary cavities of the long bones and set up localized destructive processes. Spontaneous recovery occurs, as proved by the roentgen ray.

The hip-joints were the most serious of the complications, becoming spontaneously dislocated in the early stages of the infection. The prognosis in these cases is not favorable, owing to the structural damage to the acetabular cavity and femoral head.

Casts, aspirations, incisions and diathermy are the best remedies in the treatment of gonococcal arthritis. Vaccines are of doubtful value.

The effect of the gonococcus infection on the epiphyses was to retard their growth, delay the appearance of centers of ossification and in cases of the capital epiphyses of the femur

and humerus to produce fragmentation and even complete absorption.

The sequelae are best treated by physical therapy. The dislocations of the hip-joints should not be reduced before two years of age.

PEABODY, C. W., Detroit. Chronic synovial tuberculosis. *Ann. Surg.*, July, 1927, lxxxvi, 92.

Five patients suffering from a chronic joint disorder of from two to seven years' duration presented physical findings inconsistent with those commonly looked for in established joint tuberculosis, and roentgenograms negative for bone destruction or absorption. All came to radical operation widely exposing the joint and revealing longstanding tuberculosis throughout the synovial membrane unaccompanied by any lesion of bone. Four were adults between ages of twenty-three and thirty-one in excellent general health and free from constitutional stigmata of tuberculosis. In none did a pre-operative diagnosis of joint tuberculosis seem to have clinical support.

Chronic, slowly progressing tuberculous arthritis exclusively synovial, though not usual, is a definite clinical entity to be kept in mind in differential diagnosis. In chronic monoarticular joint disease biopsy of the synovial membrane may frequently be necessary for diagnosis.

PUTTI, V., Bologna. New conceptions in the pathogenesis of sciatic pain. *Lancet*, July 9, 1927, ccxiii, 53.

Sciatic pain is symptomatic of vertebral arthritis excepting in those rare cases in which it is a symptom of a neuritis of specific nature. Sciatica is a neuralgia caused by pathological conditions of the intervertebral foramina and especially of the intervertebral articulations. In other words, sciatica is a symptom of neurodocitis and lumbarthrititis.

The terms rheumatic sciatica and idiopathic sciatica should be substituted by the more precise and adequate one of arthritic or vertebral sciatica.

To treat the sciatica it is necessary to treat the arthritis.

The treatment of vertebral arthritis is based upon the same principles as the treatment of all other arthritis of non-specific origin, therefore active hyperemia and immobilization. When these two methods are inefficacious it will be necessary to resort to resection of the diseased articulations.

## Progress in Surgery

NEY, K. W., New York. A rapid and simple method of determining nerve injuries in the extremities. *J. Am. M. Ass.*, July 16, 1927, lxxxix, 189.

In 1700 nerve injuries systemic examination has revealed that these injuries, with very rare exceptions, all involve, to some degree, even in the slightest injuries, the motor function of the fingers and toes, and that, with the exception of the upper arm type of brachial plexus lesions, an inspection of movement in the fingers and toes will reveal nerve involvement. The upper arm type of brachial plexus lesion may be readily determined by paralysis of the deltoid, biceps or triceps—most commonly all three. Injuries to the anterior crural nerve resulting in complete loss of extension of the leg are exceedingly rare, as the nerve on leaving the abdominal cavity has divided into a number of branches, all of which are rarely involved, and in serious injuries the involvement of the adjacent femoral artery completely overshadows the nerve lesion. An injury to the musculospiral nerve in any part of its course, even to the lowest portion of the posterior interosseus nerve, will result in loss of extension to the thumb. Therefore, inability to extend the thumb completely immediately suggests a musculospiral involvement. With the median nerve, injury in any location will affect the opponens pollicis, making it impossible to oppose the palmar surface of the thumb to the pads of the extremity of the fingers. While it may be possible to flex the thumb to the first phalanx by action of the flexor brevis pollicis, which is partially supplied by the ulnar nerve, it is impossible to rotate the thumb over the palm. In injuries of the ulnar nerve, the interosseus muscles are conspicuously involved, which prevents lateral movement of the fingers. Examination of the fingers will reveal the absence of these lateral movements by the inability to make the fingers into a cone; that is, bunching the ends of the fingers. Normal ulnar motor action will permit the formation of a four-finger cone; normal median nerve action will permit the rotation of the thumb and the placing of its palmar surface against the tips of the ulnar cone, making a five finger cone. Musculospiral injuries may be further confirmed by determining the presence of anesthesia over the dorsal surface of the base of the thumb, also inability to elevate the wrist and extend the fingers at the metacarpophalan-

geal joint. If the patient can make a four-finger cone, but is unable to oppose his thumb to the finger tips to make a five-finger cone, he has a median nerve paralysis, which may be confirmed by determining the loss of sensation in the palmar surface of the first three fingers and by the inability to flex the index finger when the other fingers are extended. A patient who is unable to make a four-fingered cone has an ulnar paralysis which may be confirmed by determining the loss of sensation in the little finger, and by testing the action of the interosseus muscles in individual lateral movements of the fingers. In examination of the lower extremities to determine the presence of an injury to the sciatic trunk or its two terminal divisions, the tibial and peroneal nerve, it is usually sufficient to inspect movement in the toes. If the toes can be extended, one may readily conclude that the peroneal nerve and the peroneal portion of the sciatic (external popliteal) have escaped injury. If the toes can be flexed, the tibial nerve (internal popliteal) and the tibial portion of the sciatic have escaped injury. If the patient is unable to extend the toes, a peroneal injury may be confirmed by the loss of sensation in the cleft between the great and second toe—also by the loss of dorsal flexion in the foot (extension). The inability to flex the toes means an injury to the tibial nerve or the tibial portion of the sciatic, which may be confirmed by loss of sensation in the sole of the foot and the toes, and the inability to plantar flex the foot.

CORLETTE, C. E., Sydney. On irritable ulcer of the leg or malleolus, and its cure by operation. *Med. J. Australia*, May 28, 1927, l, 782.

Irritable ulcer of the malleolus is a pathological entity with definite clinical characteristics. Though most frequent over the malleoli, it may occur in other situations. It depends on a morbid change in a cutaneous nerve. The ulcer is not the primary lesion, but a development in the course of the disease. Nerve-endings exposed in the ulcer form a factor in the production of pain, but pain precedes the formation of ulcer. There may be more than one ulcer at the site of the disease. The limb on which the lesion is situated shows signs of defective circulatory apparatus. Certain individuals display a marked predisposition towards manifestations of the disease. It is not unusual to find two separate lesions of the



same kind in the same individual at the same time, and there is a tendency towards fresh outbreaks. These are not necessarily always on the same limb. The lesions are extremely refractory to treatment usually considered suitable for ulcers, but even though they have defied other treatment for years, they can be cured in a few days by subcutaneous section of the nerve supply. In a series of cases there have been no failures, and the cure seems to be complete and lasting. But the operation does not influence the individual predisposition, and therefore does not protect against new outbreaks in other malleoli or elsewhere. It is claimed that the evidence is so abundant, so strong, and so satisfactory that the older methods of treatment should be abandoned, and that early operative treatment should now be adopted as the routine.

The method involves a minor operation with a tenotomy knife under local anesthesia. Put the patient to bed for a preliminary rest period of two or three days with the leg well elevated. Foment the part till clean. The local anesthetic is a solution of novocaine, 0.5 per cent (I have also used cocaine, 0.1 per cent), in normal saline containing adrenalin, 1:150,000. Infiltrate the subcutaneous tissue above and on either side of the diseased area (the whole of it, not the ulcer merely). Wait a few minutes. Make a small incision in the skin above the diseased area just sufficient to admit a long-bladed tenotomy knife, and push this down on either side so as to sever all the tissues from just beneath the skin down to the deep fascia or the bone. Turn the blade carefully towards the skin so as to make sure of severing all the subcutaneous tissue, and then turn it towards the deeper parts, usually with a slight under-cutting slant, and cut right down to the bone if it is the lateral malleolus, or on to the deep fascia close to the bone if it is the medial malleolus, taking care not to go deep enough to enter the deep compartment containing the vessels. Thus on either side is produced a subcutaneous division of the tissues in the shape of an inverted v. Keep the patient in bed for a week or ten days. The wound should not be interfered with after the operation, one dressing being all that is required.

The pain disappears at once. The ulcer and other lesions heal in a few days. A patch of anesthesia remains in the skin over and below the malleolus.

TELFORD, E. D., and STOPFORD, J. S. B., Manchester, England. Two cases of thrombo-angiitis obliterans in women. *Brit. M. J.* June 25, 1927, 1140.

Telford and Stopford report two cases of what they call thrombo-angiitis in women, aged about 50, one chronic and one moderately acute, both involving the upper extremities.

As they say, it may reasonably be objected that in the absence of histological proof these two cases may not be instances of thrombo-angiitis obliterans.

They say this strange disease is by no means peculiar to the Jewish race; all their cases have been of pure British blood. Meleney and Miller describe twenty-four cases from Peking, and Whyte has reported many cases in Chinese and says that the disease occurs in nearly all the provinces of China.

KLEINBERG, SAMUEL, New York. Pulmonary embolism following oxygen injection of a knee. *J. Am. M. Ass.*, July 16, 1927, lxxxix, 172.

In a case of pneumarthrosis, pulmonary embolism and cardiovascular failure immediately followed the accidental injection of oxygen into the circulation. The heart stopped beating first, followed in about five minutes by the cessation of respiration. Artificial respiration was instituted, but for about ten minutes the patient was apparently dead. An injection of epinephrine hydrochloride into the heart revived the patient and prevented what appeared a certain catastrophe. The accident was the result of faulty technique, which is acknowledged in detail, so that it may never happen again. The author in making this report hopes that it will not deter others from using pneumarthrosis, which is an invaluable diagnostic test in doubtful and properly selected cases.

WAX, S. C., San Francisco. Lattice fibers. Their diagnostic value in epithelioma. *Arch. Dermat. & Syph.*, July, 1927, xvi, 25.

This paper has been written in the hope of presenting a new means of determining (1) the transition from a simple type of growth to one in which malignancy is becoming evident, and (2) the comparative degree of malignancy shown.

The criteria on which stress has been laid are those related to the lattice fibers—their spacial

distribution and amount. These have been elucidated by a staining method (Maresch-Bielschowsky) which combines great clearness with specificity in its results.

An epithelioma may be said to be benign when it is entirely surrounded by a dense, thick network of lattice fibers, provided that the cancer cells do not penetrate into the surrounding fibers and there is a definite line of demarcation between the two.

An epithelioma of the ordinary type may be said to be malignant when the lattice fibers surrounding the cancerous growth are few or practically absent, and when, instead of showing a sharp line of demarcation between the two, the cancer cells penetrate into the bordering lattice fibers.

When an epithelioma originating from a nevus has a stroma composed largely of lattice fibers, and when few similar fibers occur at the periphery of the growth, it should be regarded as highly malignant. The more densely surrounded by lattice fibers a malignant growth is, the less is the tendency toward metastasis.

Lattice fibers are always absent in a benign, noninflammatory pigmented or nonpigmented nevus.

WOOD, DOROTHY A., San Francisco. Nitrous-oxide-oxygen anesthesia of children. Report of two hundred anesthetizations of children under ten years of age. *California & West. Med.*, July, 1927, xxvii, 68.

1. Nitrous oxide is the anesthetic of choice, especially in respiratory tract infections, tuberculosis, high fevers, diabetes, kidney diseases, and acute infections of the ear, nose and throat.

2. Children bear nitrous-oxide-oxygen anesthesia as well as adults, and there should be no age limit for its use.

3. Contrary to the old theory, children seem perfectly able to handle a closed system of anesthesia.

4. The technique of administration to children is the same as to adults.

5. Color changes in pale children are difficult to detect, and these children should receive a larger percentage of oxygen in the mixture.

6. No ill-effects were noted from repeated anesthetizations of the same subject.

7. Two hundred administrations of nitrous-oxide-oxygen were made without ether, without complications and without a fatality.

CANTOR, S. J., Melbourne. The treatment of hiccup occurring during anesthesia. *Med. J. Australia*, June 11, 1927, I, 858.

It has been found that some cases of hiccup are not associated with a tendency to vomiting and the administration of the anesthetic either in increased dosage or in diminished dosage or even withdrawal of the anesthetic does not relieve the hiccup. The action of firmly holding the nose and the application of pressure to various parts of the face alike fail to check the trouble. It is, however, immediately arrested by forcibly flexing the head on the chest for a couple of seconds.

This method of arresting hiccup is dramatic in its action; it does not interfere with the surgical operation; it is safe. Relapse is uncommon and is cured in the same way.

The method of stopping vomiting during anesthesia by holding the nose was described by Cantor ten years ago.

ANDERSON, C. M., Hermosa Beach, Calif. The use of glucose and insulin in the prevention of surgical shock. *California & West. Med.*, July, 1927, xxvii, 56.

From his observations Anderson believes that surgical shock is a suboxidation due principally to insufficient elaboration of insulin in the tissues, with a resultant acidosis, probably intracellular, as suggested by Crile. He gives glucose by mouth.

BRUCE, JAMES W., Louisville, Ky. Transfusion in infancy. *South. Med. J.*, July, 1927, xx, 515.

Citrate transfusions, while possibly not so efficient as whole blood transfusions, are much more practical on account of the ease of performance. For this reason they are preferable in children in the vast majority of cases.

Careful matching of bloods, the use of freshly distilled water, and maintenance of body temperature in the injected blood will make reactions few and not severe.

Intraperitoneal injection of blood has a field of usefulness where intravenous transfusion is impossible.

Transfusion should be done while there is still good hope of the patient's recovery, and not as a last resort.

CUMMER, C. L., Cleveland. Dermatitis produced by balsam of Peru. *Arch. Dermat. & Syph.*, July, 1927, xvi, 44.

There does not appear to be any reasonable doubt of the occasional irritating and toxic effect of balsam of Peru. Since the condition occurs but rarely, even when the drug is employed as a routine treatment, it is probably a question of idiosyncrasy. The reports indicate that when an unfavorable local effect is noted, it usually takes the form of an eezematoid dermatitis, severe enough in some instances to result in ulceration, though in one patient a morbilliform erythema was seen. Absorption may take place after local application, and this may be followed by severe toxic signs, fever, enteritis and nephritis. Occasional fatalities from absorption have been reported.

### SUPPLEMENTARY ABSTRACTS OF ROENTGENOGRAPHY AND RADIUM THERAPY

ARENS, ROBERT A., and BLOOM, ARTHUR R.  
A case of abdominal pregnancy. *Radiology*,  
July, 1926, vii, 65-66.

A woman aged thirty-six was admitted complaining of severe pain in the lower abdomen and of vaginal bleeding. The roentgenograms of the abdomen disclosed the presence of fetal structures, the entire skeleton being clearly visible. The fetus was of about four and a half months of age, and instead of lying within the pelvis it was found in the right iliac fossa extending above the iliac crest. The head and neck appeared sharply flexed upon the spine, suggesting skeletal collapse. From its size and location it appeared to be an abdominal pregnancy.

At operation an almost black amniotic sac was seen lying free in the abdominal cavity. This was ruptured, and a macerated, partly desiccated fetus measuring 26 cm. in length was removed. This case is undoubtedly one of primary abdominal pregnancy in which the fetus had gone to about four and a half months.

BELLUCCI, BRUNO. Chronic osteoarthropathy of the spinal column from the point of view of roentgen examination. *Arch. di radiol.*, July-Aug., 1926, ii, 485-533.

Roentgenography gives even a better picture of changes in the spinal column than post mortem examination because there are no post mortem changes. As a result of roentgen examination it has been possible to group the various diseases of the bones and joints of the spinal column into a few quite clearly defined groups while there was great confusion under the old method of grouping them according to clinical symptoms. Of course there are

transition types that make a careful study of the clinical symptoms necessary in connection with the roentgen picture.

The chief groups of chronic spondylitis are those of known etiology (tuberculosis, syphilis, trauma, neuropathy) and two groups of unknown origin, the deforming and ankylopoietic. In traumatic spondylitis there is a history of trauma some months or possibly even some years before. The spondylitis is quite strictly limited to the injured vertebrae and there is no osteophytosis of other vertebrae. There may be fractures, luxations, subluxations or bone callus which remove all doubt of the traumatic etiology. Traumatic spondylosis may also assume the form of traumatic kyphosis described by Kümmell and Henle. There are attacks of pain alternating with free periods and a kyphosis with a large arch, the vertex of which is sensitive to pressure.

The most characteristic feature of tuberculous spondylitis is Pott's deformity. There are also the parrot's beak osteophytes, but these are not specific; they are found in various forms of chronic spondylitis. Chronic syphilitic spondylosis is rather rare. It shows a condensing osteitis with hypertrophy of all the bone, while in the tuberculous form there is rarefying osteitis with diffuse decalcification and atrophy of bone. In the syphilitic form there is almost always a periosteal reaction which is hardly ever seen in the tuberculous form and the fungosities which are practically always present in the tuberculous form are never seen in the syphilitic form.

Chronic neuropathic spondylosis is also rare. It may occur in tabes, syringomyelia or Parkinson's disease but is most frequently seen in tabes. In spondylosis from tabes the lumbar column is most frequently affected while in the syringomyelic form the cervical column is generally affected. While this form of spondylosis may cause great deformity of the spinal column it rarely causes pain or signs of compression of the spinal cord. There is flattening of the vertebrae and osteoporosis. The articular surfaces are very irregular. The greatest change in tabes is generally in the 3d and 4th lumbar which are reduced to the form of cones; there is generally great deviation of the spinal column. There are frequently queer hypertrophic lesions in the form of osteophytes, exostoses, bridges and calcareous masses which may be detached from the spinal column and form free fragments. In this form of spondylosis there is both atrophy and hypertrophy with the former predominating.

Of the two primary forms of spondylosis, spondylosis deformans almost always affects subjects more than forty years of age and the

two sexes about equally, while ankylotic spondylosis is almost always in young men. Spondylitis deformans affects only parts of the spinal column, most frequently the lumbar segment and there are changes in both the bodies of the vertebrae and the intervertebral discs. The discs are atrophied and sometimes disappear completely so that the bodies of the vertebrae are in contact with each other. There is hypertrophy and thickening of the bodies of the vertebrae and the margins protrude, forming bridges and parrots' beaks. Sometimes these osteophytes are branching or in the form of fungi. There are also signs of osteoporosis in the form of clear spots irregularly distributed. There are no signs of uniform total decalcification and malacia such as are seen in rhizomelic spondylosis. There is ossification of the articular ligaments but never ankylosis.

The ankylotic form begins in the intervertebral joints and is inflammatory in nature as distinguished from the form described above which is purely degenerative. It generally affects the whole spinal column. The bodies of the vertebrae are normal in form and height and only show excessive transparency due to osteoporosis. There are no osteophytes. The intervertebral discs are normal.

In illustration of some of the above points the author describes 5 clinical cases with roentgenograms. Three were cases of tuberculous spondylosis, one of syphilis and the other probably traumatic, although it was impossible to make an absolutely definite differentiation between that and primary chronic spondylosis. In 3 of his 5 cases there was sacralization of the 12th dorsal vertebra. He thinks defects of this kind are not necessarily congenital but may be caused by changed static conditions in the spinal column due to pathological causes. He believes that the bridge-like osteophytes are a defense measure designed to immobilize the spinal column and so put it in the best position for healing. This explains why osteophytes sometimes develop at a distance from the pathological focus in the spinal column.

BELLUCCI, BRUNO. Two cases of inguinal fistula, one communicating with the sigmoid colon and the other with the bladder. *Arch. di radiol.*, July-Aug., 1926, ii, 561-568.

The first patient was a young woman of twenty-two who at seventeen had had an exudative pleurisy and about three years ago an attack of abdominal pain with high fever. Her physician made a diagnosis of peritonitis, prescribed local applications and in two weeks she was well. In a few months she began to have general malaise and evening rise of temperature

which was thought to be due to an apical lesion. In May, 1925, a swelling developed in the left inguinal region which increased in size until it was as large as an orange. It was opened and a large amount of pus discharged, but she did not improve; the fistula continued to secrete and her temperature remained around 38° to 38.5°. She was sent to the author in March, 1926. Examination showed a lesion of the right apex and intense and uniform opacity of the left base. A roentgenogram of the pelvis and spinal column made because he suspected a bone abscess, was entirely negative. Barium sulphate was then injected into the fistula and the roentgenogram showed that the tract communicated freely with the upper part of the sigmoid. The barium outlined the whole course of the sigmoid and had collected in the terminal part of it. There had never been any discharge of gas or feces from the fistula. The primary disease had probably been a circumscribed peritonitis following specific ulcerative colitis. A localized abscess developed which slowly made its way to the skin through the muscles of the abdominal wall. There were probably folds in the fistulous tract which made it possible for the contrast liquid to flow inward but which prevented feces or gas passing outward.

The second patient was a young woman of twenty-three married at nineteen who had never been pregnant. About eighteen months ago while she was in good health a swelling the size of an olive suddenly appeared in the right inguinal region. She had frequent desire to urinate, only a small amount of urine was passed and she had a burning pain during and after micturition. The urine was turbid. About two months after it appeared the inguinal swelling opened spontaneously and a yellowish white liquid was discharged. The ulceration healed but broke down again and this happened three times before she came for treatment in December, 1925. At that time micturition was normal and the urine clear. She had never had fever except for a period of about fifteen days the preceding summer. Urine had never been passed through the fistula. Injection of contrast fluid however showed that the fistula communicated with the bladder. At the upper pole the bladder communicated with two irregular cavities which were connected with each other and with the fistula. Operation showed that the fistula had originated from an abscess of the left adnexa.

BERGAMINI, MARCO. Foreign body (screw) in the digestive tract of an infant. *Radiol. med.*, November, 1926, xiii, 788-799.

Bergamini describes the case of an infant six months of age who swallowed a screw which

had fallen into its mouth. The screw was passed with the stool thirty-eight hours later without having caused any symptoms and without causing any after-effects. He followed its course through the digestive tract by means of roentgen rays and found that food passes quite rapidly through the digestive tract of infants of this age. Other cases have been reported in which foreign bodies have been passed without any injury. In such cases the foreign body should be followed up by roentgen-ray examination and nothing done as long as it passes normally. No manipulations should be made to hasten its passage and no surgical intervention attempted. Sweetened gruel may be given to facilitate the passage of the foreign body but purgatives are dangerous.

BERNSTEIN, ARNOLD. Obstructions in the duodenum. *Fortschr. a. d. Geb. d. Röntgenstrahlen*, February, 1926, xxxiv, 245-252.

Five cases are reported in which there was interference with the passage of material through the duodenum and in which no mechanical cause of stenosis could be demonstrated or could suffice to explain the condition. The symptoms observed were characterized by a much prolonged stay of the contrast material in the duodenum or certain portions of it, and increased shadows in the dependent portions of the duodenum. The severer forms of these cases may be very similar to true duodenal stenosis.

These cases are explained as being due to disturbance of the normal duodenal function and as having a causal relationship to diseases of the duodenum itself or of adjacent organs. The recognition of functional obstruction of the duodenum is important first in the differential diagnosis of true stenosis, and second, in that it indicates some pathologic organic process in the duodenum or in its near vicinity. The latter may be due to (1) an increased output of the stomach followed by a failure of the duodenum to accomplish the increased work; (2) failure of the pyloric reflex or presence of an open pylorus; (3) disturbance in peristalsis; (4) disturbances in normal function of the mucosa due to pathological conditions within it.

A characteristic roentgen picture in these cases shows the contrast material which normally traverses the duodenum in a few seconds to take several minutes to pass through the duodenum. In practically all of the cases there could be observed a to-and-fro movement of the contents. A re-examination after two hours usually discloses a considerable shadow formation in the dependent portions of the duodenum. In all of the cases that were operated on extensive periduodenal adhesions were

found but no actual stenosis. Occasionally there was an actual narrowing in the upper portion of the duodenal lumen, but the interesting thing is the fact that the picture of obstruction seen roentgenographically included the whole length of the duodenum.

BREITLÄNDER. Central osteoplastic sarcoma of the vertebrae in the roentgenogram. *Fortschr. a. d. Geb. d. Röntgenstrahlen*, April, 1926, xxxiv, 523-525.

A report is given of a case occurring in a boy aged fourteen who had fallen from a bicycle. He developed neuralgic pains in the lower extremities, which became acute. Introduction of lipiodol yielded nothing definite. The oil settled down to the level of the first lumbar vertebra in a non-characteristic fashion. The clinical and roentgenological signs suggested an osteosarcoma of the fifth lumbar vertebra. There was an unusual density in the structure of this vertebra while the remaining vertebrae appeared entirely normal structurally. The fifth lumbar gave a uniformly heavy shadow without signs of a structure. Its density was so great that even in the frontal roentgenogram it showed up quite clearly.

A laminectomy was performed and a myelogenous spindle cell sarcoma was found which had caused a central softening of the fifth lumbar vertebra producing a large cavity filled with soft tumor mass. This was associated with a very pronounced new bone formation of the cavity wall so that the vertebra appeared in the roentgenogram as a structureless osteosclerotic segment. This sclerosis was confined to the remainder of the spongiosa since there was no periosteal new bone formation. This observation appears to be of unusual interest. It also shows that a differential diagnosis could not be established by roentgenographic means alone.

CARTY, JOHN R. An unusual carcinoma of the esophagus: Case report. *Radiology*, July, 1926, vii, 63-64.

The patient was a man aged forty-five, somewhat emaciated, who complained of hoarseness and difficulty in swallowing for the preceding three weeks. There was a hard, fixed, deep-seated mass in the lower portion of the right anterior carotid triangle. The roentgen examination showed a smooth annular area of constriction at the level of the lower margin of the body of the second thoracic vertebra. The gullet above was markedly dilated and formed a pouch just proximal to the lesion. The barium was seen to pass straight to the constriction without first going to the bottom of the pouch and then spilling over. A very small irregular

stream passed through the stricture. The laryngoscopic examination showed a paralysis of the right recurrent laryngeal nerve. A bit of tissue taken at the point of stricture showed squamous cell carcinoma. The patient was able by swallowing air rapidly to distend the dilated esophagus, which pushed the trachea forward and caused marked respiratory distress. By flexing the head forward he was able to release the air, and the trachea assumed its normal position.

GALDAU, DEMETRIO. Osteopathology of the knee joint. *Radiol. med.*, October, 1926, xiii, 708-710.

A man aged sixty-eight was admitted to hospital in July, 1925 for pain in the right knee. It had begun in August, 1923 when the patient was working in water, caught cold and had pain in the left knee; after a few weeks it passed to the right knee. The patient was able to walk up to the end of November, 1923 but after that was bedridden. He was anemic and weak and there were signs of fibrous tuberculosis in the lungs. The right knee was swollen and sensitive, movements reduced, leg flexed on the thigh. Exploratory puncture gave a yellow liquid with no blood. Left knee also somewhat swollen but not painful.

The roentgenogram showed the classical signs of tuberculous arthritis: great atrophy, lack of periostitis, etc. In the lateral projection, in addition to these symptoms, a sort of spur of bone could be seen with its base implanted on the anterior surface of the upper third of the tibia and with its free upper extremity directed toward the joint. The left knee also showed the signs of tuberculous arthritis, but to a less degree, and the same spur. And on the proximal and distal margins of the patella shadows could be seen passing upward and downward following exactly the direction of the patellar ligament and the tendon of the rectus femoris muscle. These shadows were undoubtedly due to calcification of the patellar ligament and the tendon of the rectus femoris. The author does not believe there was any relation between the tuberculous arthritis and these pathological new formations of bone, because tuberculosis is a decalcifying disease. And the fact that the new formations of bone in the two joints showed the same degree of development while the tuberculous lesions differed in degree also indicates that they were independent of each other. He thinks the calcification developed before the tuberculosis because the bone spurs also showed atrophy due to arthritis.

Mainoldi published a similar case in 1925 which he thought was an unusual form of

Osgood-Schlatter's disease. Galdau thinks this interpretation is entirely wrong and that the calcifications were due to poor nutrition of the region caused by arteriosclerosis.

MEYLANDER, HENRY W. The surgical aspect of bone tumors. *Radiology*, July, 1926, vii, 29-35.

Few physicians are so skilled as to assume willingly the sole responsibility of diagnosis, prognosis and treatment of new growths. The roentgenologist or the surgeon who is experienced in the interpretation of roentgenograms of osseous lesions may strike a high percentage of correct diagnoses. There are, however, certain lesions that baffle the clinician, surgeon and roentgenologist until exploration is performed and gross and microscopic findings are made available.

Unless the surgeon can make a positive diagnosis of a localized benign tumor he must depend on the roentgenogram to determine the local or general type of the growths and differentiate them if possible. When a malignant growth is found he must depend on the roentgenogram or evidence of pulmonary metastases. If metastasis is not found and operation is decided on, right angled views of the lesion give important data as to the site, size, origin, penetration or invasion of periosteal structure and as to whether the condition is benign or malignant. No operative procedure is justifiable when malignancy is suspected without the roentgenographic examination of the chest. Occasionally multiple benign tumors, multiple malignant tumors and metastasis to bone from the internal organs must be differentiated, and here again the roentgenogram plays an important part.

In the last analysis the clinical and laboratory findings, the gross and microscopic findings and the roentgenograms should all be considered, as it is through cooperative effort that the greatest value of the therapeutic agents can be secured.

The surgical aspects of osteochondroma are discussed and an illustrative case is cited in a young man aged eighteen. The tumors appeared to arise in the cortical and central areas at the ends and middle of the bone of the hands. These tumors were covered with a thin layer of bone and trabeculations due to irregular growth, and bony septa were distinctly visible in the roentgenograms.

A case of osteitis fibrosa cystica in a man aged nineteen is described from the surgical and diagnostic view points. There was a bony enlargement over the fifth metacarpal of the right hand, the roentgenogram of which suggested tumor. The growth was slowly enlarging.



Roentgenograms showed cystic degeneration of the fifth metacarpal bone, middle and proximal phalanges of the fourth and fifth fingers. The contents of the cysts were removed and after thorough curettage the cyst walls were crushed in and the wounds closed without drainage. Facultative anaerobic diphtheroid bacilli were cultivated from the cyst contents.

A case of giant cell tumor is described in a woman aged twenty-two. The roentgenograms of the still left knee suggested the diagnosis of sarcoma. Further roentgenograms disclosed an area of destruction just above and involving the upper portion of the internal condyle. The tumor, which was irregular and hazy in outline, apparently originated at the epiphyseal line, destroyed the cortex, and invaded cancellous bone. There was no line of demarcation between the tumor and the periosteal structures. Amputation had previously been advised but at operation a soft tumor was thoroughly curetted and actual cautery applied. The wound was packed and a deep drain with 50 mg. of radium was left in for twenty-four hours. The pathologist's report upon the excised tumor tissue was "giant cell tumor." The patient recovered from the operation and has shown no signs of recurrence seven years since operation.

A case of endothelioma (Ewing's tumor) is described in a boy aged thirteen who complained of a rapidly growing tumor of the lower end of the left femur. Roentgenograms revealed sarcoma of the lower third of the left femur and in the chest there were signs of active metastases. Amputation through the upper third of the femur was performed and the pathologist reported an annular osteosarcoma 10 cm. long and 1 cm. in diameter. The patient recovered from the operation and left the hospital on the ninth day. Roentgen therapy was administered over the stump, groin, chest, back, pubis and the axillae daily. Coley's toxin was given twice a week. The patient gained in weight and there was no indication of recurrence at the stump. Four months later he was taken ill with what was thought to be heart disease and died suddenly. In this case the roentgenogram of the left femur showed distinct osteolysis of the shaft due to invasion by the tumor and sclerosis and osteogenesis of the shaft. Formation of new bone within the invading tumor was abundant as shown by the presence of radiating spicules. The roentgenogram showed clearly the inaccuracy of the term "periosteal sarcoma" when applied to such tumors of osteogenic type.

Another case of endothelioma in a boy aged sixteen is described. In this case operation offered relief for twenty-five months during

which time the patient enjoyed a comfortable existence.

MULLIGAN, P. B. Syphilis of the stomach: Report of case. *Radiology*, July, 1926, vii, 62-63.

A case is reported in a man aged twenty-eight complaining of vomiting and dull ache in the upper abdomen. The physical examination was negative except that the patient was much emaciated.

The roentgenographic examination of the stomach showed it to be very small with marked deformity of the pars media producing hour-glass formation and giving the stomach a dumbbell appearance. The constricted area was about 2 cm. long and about the thickness of a lead pencil. There was slight retention in the upper loculus at the end of six hours. The roentgen diagnosis was syphilis or malignancy, and although there was a negative history of venereal disease the patient's age and lack of cachexia would indicate syphilis if the Wassermann reaction should be positive. The reaction did turn out to be positive and salvarsan treatment caused disappearance of the symptoms and a return to good health.

MUZII, MARIO. Biliary calculus and cyst of the pancreas. *Arch. di radiol.*, July-Aug., 1926, ii, 577-583.

A young woman of eighteen was sent to the author with a diagnosis of gallstones. A roentgenogram of the liver region on a film 24 X 30 with a Potter-Bucky diaphragm in the dorso-ventral direction showed two irregularly round opaque shadows both of them a few centimeters outside the spinal column, one at the level of the intervertebral disc between the 1st and 2d lumbar, the other between the 2d and 3d; they lay within an elongated shadow with clear outlines with a rounded lower pole extending from the shadow of the right psoas to the shadow of the kidney and partly superimposed on the latter. In a second roentgenogram in the ventrodorsal direction with a Potter-Bucky diaphragm also and exercising pressure on the abdominal organs the two shadows could be seen displaced outward and upward and isolated from the kidney shadow. In the dorso-ventral picture they were smaller and had clearer outlines than in the ventrodorsal one, which showed they were nearer the anterior wall. These findings showed beyond doubt that they were two gallstones, but it did not explain the reason for the distance between them or the difference in their position in the two projections. The latter could only be explained by great mobility of the gall-bladder or liver and the former on the supposition that the shadows



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represented only the nuclei of the gallstones or that they were separated by other stones that were not visible.

But the gallstones did not explain all the clinical picture, as the history showed that recently the right subcostal pain had become epigastric, fixed and constant without any special relation to the gall bladder region. Palpation also showed that the area of greatest pain was beneath the ensiform process of the sternum and that there was a uniform round resistance here. A roentgen picture of the gastrointestinal tract showed an indentation of the lesser curvature of the stomach, displacement of the stomach to the left and a filling defect of the antrum and pyloroduodenal region from pressure on the part of a round body outside of and posterior to the stomach. There was evidently a tumor here but its nature could not be determined from the roentgenogram.

Prof. Busi made a probable diagnosis of cyst of the pancreas from retention, due probably to a calculus in its descent having injured the mouth of the pancreatic duct in Vater's papilla. He admitted however that it might be a retroperitoneal echinococcus cyst. Operation showed a mobile cornuate gall-bladder containing several stones, two of them large ones with calcareous nuclei, the ones that showed in the roentgenogram. It also showed a retention cyst of the pancreas. The patient recovered and is in excellent health.

PAZZI, ERMANNQ. Anterior luxation of the body of the sternum on the manubrium shown by roentgen examination. *Arch. di radiol.*, July-Aug., 1926, ii, 569-576.

A man of thirty-five was thrown from his automobile when a front tire burst and then the machine overturned on him. He struck on his head and there was a large lacerated, contused wound of his scalp in the left parieto-occipital region. When the machine fell on him he felt an intense pain in the chest. There was a swelling at the angle of Louis; the patient complained of painful pressure in the anterior part of the thorax which increased on inspiration and on movements of abduction, extension and elevation of the arms. The skin was

intact over the swelling; there was no crepitation on palpation but a certain mobility in the lower half of the swelling. The roentgenogram showed that the body of the sternum was displaced forward on the manubrium and the two parts were completely detached from each other but that there was no fracture. This case is interesting from the fact that isolated lesions of the sternum are rare; it shows that luxation of the body of the sternum on the manubrium can be produced by indirect violence and the roentgenogram confirms what has been reported by other authors, that in this form of luxation it is the manubrium which remains in place while the body is displaced forward.

PAZZI, ERMANNQ. Another case of multiple myeloma of the bones diagnosed by roentgen examination. *Radiol. med.*, November, 1926, xiii, 799-803.

A man aged forty-six with no personal or family history of any importance suddenly had intense pain in the back with radiation to the lumbar region. These attacks were repeated for some months after which he had no more acute attacks but a constant dull pain in the lumbosacral region. Various diagnoses were made such as arthritis, uricemia, rheumatism, lumbago. When he was sent to the author's genito-urinary clinic a roentgen examination of the kidney region was made as is done systematically in all cases. This showed great changes in the vertebrae, especially the 12th dorsal and the 3d lumbar. Another examination of the ureteral and bladder region showed changes in the sacrum, pubis, ilium and heads of the femurs. The bones, especially the spongy parts, were spotted, with decalcified transparent areas and others darker from condensation of bone. These zones were more or less rounded but with irregular outlines and of various size. The vertebrae were flattened. The same changes were found in the bones of the head and arms and in the ribs. Bence-Jones bodies were found in the urine. This case of multiple myeloma of the bones could not have been diagnosed in any other way than by roentgen examination.

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## A CRITIQUE OF THE OPERATIVE THERAPY OF ANGINA PECTORIS BASED ON A CASE OF VOCAL CORD PARALYSIS FOLLOWING SYMPATHECTOMY\*

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IT is the purpose of this paper neither to present a brief for nor to pass judgment on the operation of sympathectomy, but rather to tell the story of a postoperative complication that for a short time was almost tragic and then, for a longer period, caused an overwhelming amount of discomfort. A single instance of this sort serves as a totally inadequate basis on which to rest any dogmatic principle; it may well serve, however, as a check against unwarranted surgical enthusiasm, or at least as a corrective for numerous statements in the literature concerning the simplicity and innocuousness of the operation of cervical sympathectomy. Just now the crest of a rather typical wave of surgical enthusiasm seems to be flattening a bit and it may be timely to use a single case report as a text for a discourse on differences of opinion concerning the remedial value of operative therapy for the pains of angina.

### CASE REPORT

On May 5, 1925, I was called by Dr. A. E. Taussig to see a woman aged fifty-eight years who was suffering with shortness of breath, precordial pain and general weakness. The

symptoms had persisted for seven years and during a large part of that time had been accompanied by pulsus alternans. During these seven years she had been hospitalized several times under the care of Dr. Taussig, who had made the diagnosis of chronic myocarditis, auricular fibrillation and mitral insufficiency with angina pectoris. The pain distribution was along the left side. At the time that we saw her, she was particularly distressed by the radiating pains of angina plus a sort of "heart clutch" which, she said, had of late been continuing through twenty-four hour periods without intermission. We both felt that there might be some question regarding the advisability of sympathectomy on account of the high degree of cardiac damage, but we were influenced by a desire to side-track the torturing pain, which had up to then resisted all medical therapy.

On May 29, a left-side cervical sympathectomy was done under  $\frac{1}{2}$  per cent novocaine infiltration, preceded by hypodermatic administration of  $\frac{1}{100}$  grain hyoscine and  $\frac{1}{4}$  grain morphine. The superior cervical ganglion with all its communicating branches, the middle cervical ganglion and the intervening trunk of the sympathetic were removed. At operation, the vascular bundle was located without difficulty and was retracted medially. After a patient search, the sympathetic was not found

\* From the Surgical Service of the Jewish Hospital, St. Louis. Read before the American Surgical Association May 13, 1927.

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in its normal position, so the sheath of the vascular bundle was dissected on its posterior aspect, thus exposing what seemed to be the sympathetic trunk, closely adherent to what seemed to be the vagus, in the same relationship that exists in the dog. In order to identify these two nerves positively, the pulse was counted while gentle forceps pressure was made on each nerve in turn. The slowing of the pulse rate which follows pressure on the vagus, enabled us to differentiate the two nerves. Then the sympathetic and its two upper ganglia were resected. The patient stood the ordeal of operation well and experienced an immediate relief from the severe anginal pain with which she was suffering up to the time she received her preoperative injection of hyoscine and morphine. The day after operation, however, it was noticed that she could not speak above a whisper. The laryngologist, Dr. E. B. Westlake reported abductor paralysis of the left vocal cord. This paralysis, constituting, as it does, the most important phase of this report, will be dealt with in detail under the head of epicritical remarks. The patient was discharged to a convalescent home nineteen days after operation. Wound healing had been uncomplicated and the patient was inexpressibly thankful for her deliverance from pain. She had the usual postoperative pain radiating to occiput and shoulder but she stood it without a murmur.

About three months later she was readmitted to the hospital complaining of severe substernal pain. This did not radiate to either the right or left side. The patient, motivated by the two months of freedom from pain that followed the first operation, was anxious to have the right sympathetic resected. Dr. A. E. Taussig felt that such a resection was well worth attempting, whereas I was rather distrustful of further surgical interference. After a formal discussion with all the internists of the hospital, it was decided, in spite of the advanced degree of cardiac damage, to resect the right sympathetic nerve.

December 15, 1925 this operation was done. We encountered exactly the same anatomic anomaly that we had met at the first operation, namely the fusion of the sympathetic nerve with the vagus. This time, however, the nerves were separated with the greatest care and gentleness and they were stimulated with a bipolar electrode instead of a forceps pressure.

In spite of these precautions, however, when the patient began to emerge from her twilight anesthesia about twenty minutes after her return to bed, she manifested a most alarming dyspnea. It seemed that tracheotomy would be imperative, but fortunately the respiratory mechanism adjusted itself to a degree that made it unnecessary to resort to this emergency procedure. Dr. Guggenheim, then the laryngologist on service, reported abductor paralysis of the right cord. Both cords were now fixed in the position of adduction with an inefficient chink between them.

The patient reported herself free from pain after this operation, but complained bitterly of dyspnea that did not permit the slightest exertion. Indeed, she could no longer, in any trustworthy fashion, differentiate the discomfort of pain from that of dyspnea. Gradually as the cords atrophied, she secured a sufficiently wide chink to breathe quietly in fair comfort at the time of her discharge from the hospital, six weeks after operation. At this time she reported herself free from pain.

Two months later, she was readmitted to the hospital, with symptoms of cardiac decompensation. She did not complain of pain but only of dyspnea. The laryngologist reported that the severe dyspnea was not due to the cord paralysis because there was a sufficient chink to permit of free and quiet breathing. It is reasonable to assume that this dyspnea may have been the result of cardiac decompensation due to the previous sympathectomies. After about two weeks' stay in the hospital, the heart failed and death occurred.

Isakowitz (referred to later) believes that the heart muscle degeneration induced by sympathectomy predisposes to cardiac decompensation.

**Epicritical Remarks.** Here, then, was a patient suffering with angina pectoris due to a heart so damaged that there might have been reasonable and legitimate doubt regarding the advisability of surgical interference. She was subjected to two operations. The operations were followed by two types of postoperative complications: one type we may characterize as minor because the patient reported herself as content to put up with resultant dis-

comfort in exchange for the chest agony that it replaced. I refer to the radiating occipital and shoulder pains that so frequently follow sympathectomy. The other type was a major complication, a distressing dyspnea which for a while was actually life-threatening. The left cord paralysis was attributed to pinching the vagus too hard with a forceps. This was probably a false conclusion for the right vagus was not pinched and yet a right cord paralysis occurred. The probability is that in separating the sympathetic from its intimate connection with the vagus, some injury was done to the fibers of the recurrent laryngeal nerve as they run in the vagus. How to avoid such injury I do not know, nor do I know how often an anomalous relationship between vagus and sympathetic occurs.

The neck organs of the patient were removed after death. Unfortunately the left vascular bundle was destroyed in the process of embalming. We were able, however, to dissect out the vagus and recurrent laryngeal on the right side. Professor S. W. Ransom of the Washington University School of Medicine kindly undertook to examine the recurrent laryngeal nerve for evidence of degeneration. He found none but he reported that "The Marchi method was not applicable because degeneration, if any, had been in progress too long; therefore, the presence of individual degenerating fibers could not be detected. The Pal-Weigert method showed the nerve apparently normal. It is impossible, however, to say that a few fibers may not have degenerated. One can only say that there is no massive degeneration indicating destruction of the nerve as a whole." Based purely upon clinical findings the inescapable conclusion presents itself that seemingly insignificant trauma of the vagus nerve may compromise those fibers of the recurrent laryngeal nerve that abduct the vocal cords. Even granting the great danger of a bilateral abductor paralysis of the vocal cords, we need not accord too much

consideration to this complication in the course of a sympathectomy because trauma to the vagus will always be a more or less unusual incident in this operation. But the fact is demonstrated that it is a complication and we must weigh this complication together with the other ones that have been reported before we can reach any safe conclusions regarding the performance of surgical operations for the relief of angina pectoris. This particular patient reported that she would willingly stand her postoperative discomfort rather than endure the pains of angina. Of ominous significance in this case was the terminal dyspnea, which may have been the result of cardiac decompensation secondary to heart muscle degeneration. As will be seen later sympathectomy may cause degeneration of the heart muscle.

As surgeons, we should be concerned most seriously with two problems: (1) To what degree are we able to overcome the pains of angina pectoris? (2) Are the surgical measures that we employ rational and safe? It would seem that we are not warranted in dismissing with a gesture, the unqualified objections of the late Sir James Mackenzie to cervical sympathectomy; and there seems to be less warrant for accepting at their face value the statements of those surgeons who see no possible harm in the operation, provided the patients are carefully selected. It is difficult to know how much weight to accord to the experience of such a judicious author as Cutler<sup>1</sup> when he says that he has never observed "any deleterious effects on cardiac capacity as a result of operation." It is almost impossible to agree with him when he says that available experimental and clinical evidence demonstrate that such procedures as nerve ablation for angina pectoris "in no way incapacitate the heart."

The fact of the matter is that there is a disconcerting diversity of opinion regarding the type of operation best suited to palliate the pains of angina pectoris, the permanency of results obtained by operat-

ive procedures and the immediate and remote menace to life inherent in the various operations.

Even a cursory survey of the literature emphasizes these conflicting opinions. At the very outset of an inquiry of this sort, one is struck by the fact that no less than ten, and possibly more operations have been devised for the relief of angina pectoris: cervical sympathectomy with resection of the stellate ganglion; section of the depressor nerve; paravertebral block; section of fibers emerging from the vagus; section of the rami communicantes arising from the stellate ganglion; section of the cervical sympathetic above the lowest ganglion with section of the vertebral nerve; section of the sympathetic nerve above the stellate ganglion; cervical sympathectomy without resection of the stellate ganglion; resection of the cervical sympathetic cord with resection of the cervical vagus branches that enter the chest and certain rami communicantes; section of the cervical sympathetic together with the superior cardiac nerves. When more than half a dozen operations have been devised for the relief of a condition, one may safely presume that wisdom demands a most cautious attitude of healthful and reasonable doubt regarding the precise value of any of them.

If surgical enthusiasm leads away from such a spirit of doubt, then one should at least contemplate and weigh the frank admissions of enthusiastic supporters of the operative relief of angina regarding operative mortality, postoperative complications and the percentage of permanent operative cures. In reports of Leriche,<sup>2</sup> of Brown and Coffey<sup>3</sup> and of Hofer<sup>4</sup> one encounters quite enough to make one cautious in reaching a final and dogmatic judgment on the operations for angina.

This caution is reenforced if one harkens to those authors who set about in various ways and from various angles to express critically destructive opinions regarding the surgery of angina pectoris. The late Sir James Mackenzie, in the last edition of

"Diseases of the Heart," delivers a veritable diatribe against surgeons in general and surgeons in particular who perform the operation of sympathectomy for angina. Only a bold surgeon may wave aside such an opinion as totally unwarranted. No wise surgeon should attempt to cure angina without having read Sir James' conclusions at least once.

Daniélopou<sup>5</sup> believes, in consequence of observations made on dogs and on patients that resection of the stellate ganglion is dangerous and induces grave disturbances of ventricular conductivity and degeneration of the myocardium. This author in his turn has devised an operative technique that is supposed not to damage the centrifugal fibers that run through the stellate ganglion. In another article, Daniélopou says that removal of the stellate ganglion as an operation must be definitely abandoned. Leriche<sup>2</sup> cautions against both excision of the stellate ganglion and excision of any cervical ganglion. He shares Daniélopou's fear of pulmonary edema after stellate ganglion excision and believes that removal of any of the other cervical ganglia may be followed by persistent troubles of a more or less compromising character.

The Czecho-Slovak Surgicogynaecologic Society<sup>6</sup> devoted a meeting to a particularly interesting discussion of the proposal of its president, Professor Kukula, to resect the sympathetic around the aorta and in the anterior mediastinum. Professor Kukula was himself a sufferer from angina of which he eventually died. He spent his last months studying angina. In his clinic, relief followed in 60 per cent to 70 per cent of cases of sympathectomy. Kukula himself, however, was unwilling to submit to operation on account of such undesirable complications as atony of the esophagus, with irregularities of deglutition, hemorrhagic pleural effusions and irritation of the third branch of the trigeminal nerve.

Brandsburg<sup>7</sup> performed unilateral or bilateral sympathectomy on 20 dogs and 12 rabbits and then examined the heart

muscle at period ranges from 1 to 100 days. He found that within the first few days after operation there was dilatation of the blood vessels with hyperemia, edema, intramuscular round cell infiltration and an initial stage of muscle striation, followed by its disappearance. These changes he interpreted as indicating a disturbance of muscle nutrition, causing parenchymatous degeneration. Up to the fourth postoperative month, the degenerative changes in the heart muscle became more pronounced.

Lewit<sup>8</sup> also was convinced that the heart muscle suffers as a result of sympathectomy. He admits the advisability of the operation if the heart muscle is comparatively sound but says that if this be not the case the operation has more against it than in its favor.

One must evaluate the worth of operative procedures for angina on the basis that they furnish freedom from pain or that they induce discomfort and danger due directly to postoperative complications. In other words one must determine whether they accomplish good or work harm or possibly do both harm and good to a measurable degree. To practice such judgment is difficult, because many patients with angina pectoris not subjected to operation experience spontaneous and lasting freedom from pain due most frequently to weakened heart muscle and lessened pressure. Other patients who have been operated upon do badly because of essential heart failure unrelated to the operation. The fact is that there has been very little work done from the purely clinical side that is of help to the thoughtful, conservative surgeon seeking to set for himself rational indications on which to rest his operative therapy for angina pectoris. One of the few and one of the best clinical studies has been made by Hermann Isakowitz<sup>9</sup> from the Third Medical Clinic of Berlin University.

Isakowitz points out the difficulties involved in a clinical study of patients whose hearts almost invariably show involvement of muscle or of vessels of supply. He

realizes the impossibility of determining accurately whether postoperative symptoms are referable to progressive cardiac disease or to postoperative cardiac compromise. He is influenced very largely by the animal experimentation reported by Brandsburg (detailed above) and by earlier work done by Friedenthal<sup>10</sup> in 1902. Friedenthal showed that vagosympathectomy in the dog markedly compromised the animal insofar as heart function was concerned. Isakowitz studies instances of sympathectomy and stellate ganglionectomy by Lewit, sympathectomy by Hesse, depressor nerve resection by Guggenheimer and sympathectomy by Sachs. He comes to the conclusion that although a normal heart may tolerate very well the removal of a part of its extracardiac nervous mechanism, a compromised heart is crippled additionally by such procedures. He emphasizes the distressing dyspnea that comes on after operation and states that when dyspnea develops in a patient who previous to operation was free from this embarrassment, the safe conclusion is that the heart function was compromised by the operation. He is not inclined to feel that we are in a position to draw warrantable conclusion from those patients who experience relief after operation because not enough time has elapsed in most instances; and he emphasizes the need of according proper respect to the moderately high operative mortality rate. In general, his stand is one of marked conservatism and his counsel is to regard operative therapy as a last resort to be applied only after most intensive clinical study of the patient and then only after carefully and persistently applied medical therapy, combined with psychotherapeutic efforts directed toward aiding the patient's morale.

And so we see that the problem is far from being a simple one. Cutler's admirable words of caution should be borne in mind: "It should be remembered by all who would shoulder the responsibility of operating on such patients that this study is still in its experimental stage and that only

those who are carefully studied and carefully selected before operation can be justifiably submitted to operation." I should add that such careful studies can be made only by a qualified internist and that no other surgical procedure calls for closer cooperation of internist and surgeon than does the operative attempt to palliate angina pectoris.

## REFERENCES

1. CUTLER, E. C. and FINE, J., Sympathectomy in angina pectoris. *J. A. M. A.*, 1926, lxxxvi, 1972.
2. LERICHE, R. Fourteen cases of section of rami communicantes. *Bull. et mém. Soc. de Chir.*, 1915, i, 990.
- and FONTAINE, R. Certain phenomena observed after severing last cervical and first dorsal rami communicantes. *J. de chir.*, 1926, xxvii, 143-155.
3. BROWN, P. K. and COFFEY, W. B. Surgical treatment of angina pectoris. *Arch. Int. Med.*, xxxiv, 417-445.
4. HOFER. Quoted by W. B. Mosser. *Arch. Surg.*, 1926, xiii, 677.
5. DANIELOPOLU, D. Pathogenesis of angina pectoris. *Wein med. Wchnschr.*, 1924, Nos. 17, 19, 22; pp. 841, 951, 1116, 1121.
- Pathology and surgical treatment of angina pectoris. *Brit. M. J.*, 1924, ii, 553-557.
- DANIELOPOLU, D. and MARCU, I. Changes of electrocardiogram provoked by removal of stellate ganglion after ligature of coronaries; surgical treatment of angina pectoris. *Bull. Acad. de méd., Par.*, 1925, xciv, 892.
6. Report of Czecho-Slovak Surgicogynaecological Society. Abstracted in *J. A. M. A.*, 1925, lxxxv, 1904; 2002.
7. BRANDSBURG, B. Experimental investigations on histologic changes of heart muscle after sympathectomy. *München, med. Wchnschr.*, 1925, lxxii, 1775-1777.
8. LEWIT, W. S. Cervical sympathectomy as palliative operation in angina pectoris. *Centralbl. f. Chir.*, 1924, li, 2529-2535.
9. ISAKOWITZ, H. Heart muscle injury after division of the extracardiac nerves. *Centralbl. f. Herz u. Gefaesskrank.*, 1926, 105.
10. FRIEDENTHAL, J. Resection of extracardiac nerves in mammals. *Arch. f. anat.*, 1902, Phys. Abt., 135



## [SURGICAL SUGGESTIONS]

**M**OBILIZING and rotating the duodenum not only facilitates removal of stones from the depth of the common bile duct but also provides a means of making sure that all are removed. Occasionally transduodenal or retroduodenal choledochotomy is necessary to dislodge a calculus from the ampulla of Vater.

**P**ROLONGED tube drainage of the hepatic ducts to evacuate any bile sand, inspissated bile and bacteria that may be present and thus to reduce the tendency to further stone formation is the wise course to adopt in any case of hepatic duct calculi, whether or not there is evident infection.



# SECONDARY SEX CHARACTERISTICS AND THE GONADS

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THE general concensus of opinion seems to be that the secondary sex characteristics, in both the lower animals and man, are dependent chiefly upon the integrity and type of their respective gonads.

This opinion apparently is based upon the fact that castration of immature animals prevents full development of the secondary features. That these characteristics are not necessarily dependent upon the gonads is shown by several facts. Belfield mentions two observations, in this respect, that are worthy of consideration, viz.:

1. The complete sex features of mind and body, including the external genitalia, have been found in persons congenitally devoid of gonads, as proved by post-mortem examination. (Montfaleon relates a case, reported by Cabral, of a soldier who was hanged for rape, who, on dissection, was found to be without testes in either the scrotum or abdomen.)

2. The sex features including the external genitals of one sex have been exhibited by persons congenitally devoid of gonads normal to that sex (Figs. 1 and 2).

The belief that sex emanates from the gonads is based on the idea that the two sex complexes are separate entities which are immutable and antagonistic. The biologic conception of sex, on the contrary, is that it is but a single entity with variable degrees of femininity. According to Benda "the primary anlage of the entire sexual system of the vertebrae must be regarded as female," whereas Belfield claims that, "the fertilized egg is a potential female whose deviation toward the male is essentially a failure of potential development."

Early in the development of a neutral body, specialized reproductive tissue, or germ-plasm, is distinctly different from that of the body tissue, or somatoplasm, from which the gonads develop. This germ plasm is apparently of two types, that characteristic of the male and that of the female. The association of these reproductive tissues with the somatoplasm establishes sex. However, sex characteristics do not necessarily depend upon the presence of active germ-plasm nor the type of reproductive tissue present. The thyroid, pituitary, adrenal, and other glands all play a definite rôle in sex characteristics and may cause a more definite change in these when diseased than even those caused by the gonads (Fig. 3). Cases have also been reported in which the secondary features of the male, including pronounced beard development, and even hypertrophy of the clitoris, have developed in young girls because of hypernephromatic development as well as with diseased thyroids, that are similar to those caused by a cystoma of the ovaries (Fig. 4). In 1849 Berthold demonstrated the fact that the testes have a dual function: the production of spermatozoa, and the elaboration of an internal secretion, both of which served a common purpose.

At the present time there is no definite evidence that the sex characteristics of the male are associated with spermatogenesis. On the contrary, there is considerable evidence indicating that these characteristics are due largely to the action of certain cells lying in the interstices of the seminiferous tubules known as interstitial cells, which were discovered by Leydig in 1850. Kölliker in 1854 demonstrated these cells, not only in the interstices of the tubules but also under the tunica albuginea.

According to Borim and Ancel, Chapin, Allen and Whitehead, the interstitial cells make their appearance in the fetus and functionate even before the spermatogenic cells are fully differentiated. If the secondary sex characteristics are entirely due to the function of these cells it is obvious that they would be absolutely essential to all forms of life, yet Pezard claims that they are not present in certain forms of life.



FIG. 1. Man, aged forty-seven years, with normal masculine sexuality; penis of typical structure, smaller than the average. (After Neugebauer.)

He has failed to demonstrate the presence of interstitial cells in adult Orpington fowls, as well as in golden pheasants, and says that they are absent even during their greatest sexual activity. Boring and Pearl, however, claim that the interstitial cells are demonstrable in male chicks just before being hatched but not in adults.

According to Felix, the interstitial cells develop in the human fetus in the second month of fetal life, and become quiescent

at the fifth month, when their formation ceases until after puberty. These cells in some instances remain long after complete degeneration of the spermatogenic tissues. Therefore the disappearance of the spermatogenic tissue does not alter the normal progress of sex characteristics, whereas, he claims, degeneration of the interstitial cells causes a loss of libido and the change of sex characteristics as seen in eunuchoid-

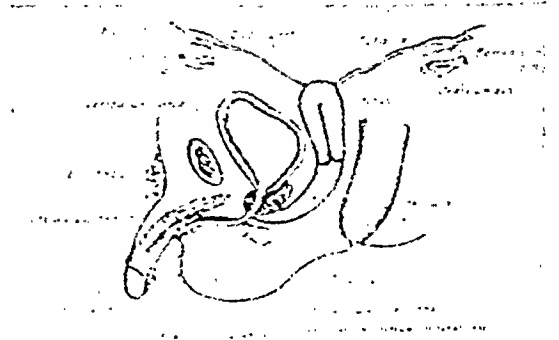


FIG. 2. Internal sex organs of man pictured in Figure 1; ovaries, tubes, uterus and vagina emptying into posterior urethra (utricle); prostate gland; suprarenal cortices (not portrayed), about five times as large as normal; no testes. (After Neugebauer, who compiled reports of 13 men so constructed.)

dism and pseudohermaphroditism. In birds, mammals, and other animals there is a close relationship between sex maturity and the appearance of secondary sex characteristics, which are more manifest in the male as shown by the lion's mane, the horns of the stag, the variegated plumage of birds, the phosphorescent organs of the firefly and glowworm, and the distribution of hair in man. Whether or not the sex characteristics are determined by the sex glands depends upon the form of life considered. In insects they are not. (Oudemans, Mersenhimer and Kellogg.) Removal of the sex glands from the gypsy moth, for instance, in no way alters its characteristics.

In certain animals the sex characteristics are cyclic and appear only during their sexual activity as seen in the antler growth of the stag, nest building by the male birds, and the peculiar saliva of the crocodile.

During the rutting season, stags are

highly nervous and always ready to fight for possession of the hinds, fish exhibit marked coloration, the lyre bird develops an elaborate tail. When the season of sexual excitement is over, the prongbuck loses his horns, stags will herd together, nest building ceases, the fish lose their coloration and the lyre bird the tail, all to be assumed again the next season.

In warm-blooded species, the heavy

in these birds. Similar changes may occur in young hens after castration. The mutation from the female toward the male characteristics has been observed in all periods from fetal life to old age. Darwin recorded cases of an old duck which assumed the plumage of a drake, as well as a castrated duck which assumed the characteristics of a drake, and of an old sterile deer which developed antlers. Gold-

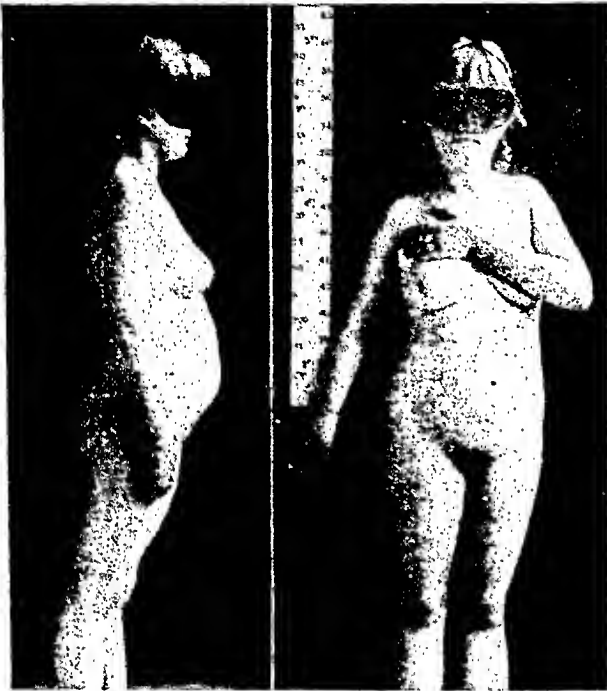


FIG. 3. Case of Dr. Gilbert Horrax. Reproduced by author's permission from *Arch. Int. Med.*, 1916, xvii, 629. Girl of eleven years, height 152 cm. (60 in., 114 lb.). At one year began to develop abnormally physically; menstruated regularly and showed other secondary characteristics just before eleven years. Supposed to be a case of pineal disease; roentgen ray showed enlargement of sella tureica.

burden of reproduction imposed on the female is transitory, and cessation of ovulation is sometimes accompanied by a change of feminine to masculine features. In the woman a change of the distribution of fat, development of beard, change of voice, and other features characteristic of the male are often seen after the menopause. The change of plumage of the female toward that of the male and the development of spurs in old hens are familiar, but such change cannot be ascribed to testes since they do not exist



FIG. 4. Normal menstruating girl at sixteen years; at right, same girl at nineteen, with full beard; no menstruation for two years; necropsy, multilocular cystoma of ovary. (From Alberti.)

schmidt contends that no animal, including the human, is purely male or female, that each has the potentialities of both. He thinks that sex intergrades are not degenerates, inasmuch as fifty per cent are found in normal families. He claims that they are the resultant of crossed matings in persons of different genetic constitutions, inasmuch as "contrary sexualis" is of greater ratio in these people than in those more sanguinely constituted. Forty years ago Pfluger found that of one hundred frogs caught in the spring, 84 per cent were females and only 16 per cent males, as determined by the gonads, whereas of 100 frogs in the fall, about 50 per cent were male and 50 per cent female. He found that in the newly transformed frogs the ovary constituted the greater part of the gonad: with time the ovary atrophied and the testicular portion developed in about half of them. In some of them transmuta-

tion was incomplete and the gonad became a composite ovo-testis.

Belfield says that tadpoles usually develop into male and female frogs in equal number, but that by feeding them tumors of the human suprarenal cortex they are transformed almost exclusively into male frogs. There are a number of cases on record of hens that carried on all the functions of a hen and later developed

tuberculous, the infection having destroyed the ovary, which was replaced by a sperm-producing testis.

The intersexual or composite gonad-ovotestis has been found in such female mammals as the mole, goat, pig, dog and woman (Fig. 6). Belfield says "such ovo-testes are probably not rare in the human subject. Three are reported by one observer, but have been until recently rarely looked for."



FIG. 5. Bird above shows comb and wattles of cock, tail and spurless legs of hen; bird in middle, transformed hen with one sperm-producing testis, and an atrophied ovary, with one corpus luteum; bird below, ovary, no testes. (From Boring and Pearl.)

all the characteristics of a cock, including plumage and the development of wattles and comb (Fig. 5). Crew reports an instance in which a chicken was an egg-laying hen until three and one-half years old, when in successive moltings, she was transformed into a cock, which fertilized a hen from whose eggs young chicks were raised. Post-mortem examination showed the transformed hen to be extensively

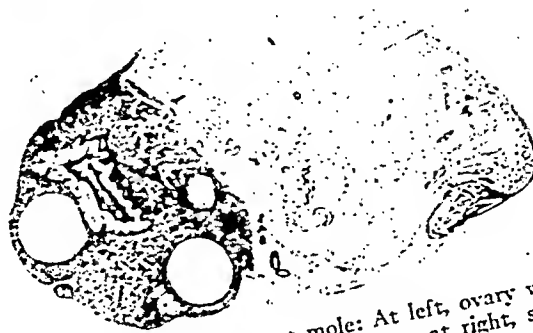


FIG. 6. Gonad of pregnant mole: At left, ovary with typical follicles and corpus luteum; at right, spermatic tubules. (After Kohn.)

Steinach and Sand successfully grafted ovaries from female guinea pigs into previously castrated males and state that these "feminized males" developed characteristics peculiar to the female, such as hypertrophy of the mammary glands, female skeleton, and texture of hair. "Masculized females" also took on the somatic characteristics of the male.

The mutation of sexes is chiefly from the female to the male. This is well demonstrated in the observations made by Lillie on the free-martin, a female twin of the male calf, which develops sexually indifferent to cows and bulls alike and resembles an ox. In the free-martin, the internal reproductive organs are chiefly male whereas the external are female. Lillie's observations show the free-martin to be primarily a female, with ovaries, tubes, uterus, and vagina, which later becomes modified to the male type by means of a male sex hormone, thought to be from the secretion of the interstitial cells which circulate in the fetal circulation supplying both twins. If the circulation of both twins

is separate this does not take place, and in case of both twins being male they develop normally and are fertile.

Edmunds<sup>6</sup> reports a case of an apparent girl who manifested all characteristics of a girl until she was fourteen years of age when the testicles descended and revealed the true sex. Betts<sup>7</sup> reports a case of a man weighing 190 pounds, who had a scanty beard with feminine pubic hair, a hip measurement of 42 inches, and a large pendulous breast 8 inches in diameter, with a clitoris  $1\frac{1}{4}$  inches long and 3 inches in circumference, with a rudimentary vagina, but no scrotum or vulva. On operation, a mass 8 pounds in weight was removed from the abdomen. It consisted of 8 small masses all of which, Betts claims, resembled ovaries. His amorous desires were toward females and he was said to have been happily married.

#### BISEXUALITY A NORMAL INHERITANCE

Bisexuality has been recognized as long as there has been an historical account of mankind. In fact, the Biblical account of creation not only records the dual nature of man but likewise that of his creator. In Genesis 1:26-27 we read, "God said let Us make man in Our own image after Our own likeness, and let Them have dominion over the fish of the sea, and over the fowl of the air and over the cattle, and over all the earth and over every creeping thing that creepeth upon the earth. So God created man in His own image, in the image of God created he him: *male* and *female* created he them," whereas in Genesis 5:2 we read, "male and female created he them, and blessed them and called their name Adam in the day when they were created," which, according to Scripture, was the sixth day of creation. Later, after Adam had named all the beasts of the field but was without "a helpmeet," God caused him to fall into a deep sleep, and, after removing one of his ribs, made a woman. Adam, recognizing her, said, "this is now bone of my bone, flesh of my flesh; she shall be called woman because she was taken out of man." It is quite obvious

that Adam was created a composite male-female as God "let them have dominion over the earth" and "called their name Adam." It was only after the feminine component of Adam was removed and became a distinct separate entity that she was known as woman. Pagan history and mythology frequently refer to the bisexuality of man. Even the Greek god of masculinity, Hercules, was also represented



FIG. 7. Hercules.

as being composite male and female (Fig. 7).

The old Hebrew idea of Urin and Thummin, male and female principles, clearly demonstrate their belief in bisexuality. Paul Carus relates in the Oracle of Yahveh that in Chinese documents written 5000 B.C. known as Yih King (Book of Changes), Fuh Hi, the mythological founder of Chinese civilization, carries a tablet in his hand on which are inscribed the symbols of Yang and Yin, the two sets of opposite contrasts, male and female, both of which are supposed to hold the secrets of the universe. The Chinese claim that "all things that exist are but a mixture of these two, and the conflict between these influences is responsible for all problems." Freud<sup>8</sup> was one of the first investigators to give us a comprehensive idea of the bisexual nature of mankind but was inclined to consider it as physical hermaproditism and abnormal, whereas recent writers are inclined to consider it a normal-

ity and primarily a part of each individual. Hence man and woman are not purely masculine and feminine but a variable mixture of both, the characteristics being largely determined by the sex element predominating. Physically these rudiments of sex organs of both sexes are in each person at birth. These atrophied remnants in the primitive body remain inactive and dormant until activated by some specific

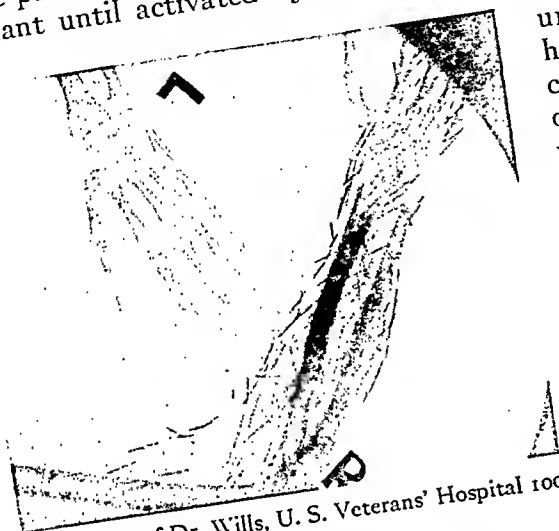


FIG. 8. Case of Dr. Wills, U. S. Veterans' Hospital 100.

stimulus, when the castrate may become feminine and the woman develop the male attributes frequently seen after the menopause. Berman<sup>2</sup> maintains that femininity and masculinity have a definite basis in the reaction of the internal secretions, but there is no absolute feminine or absolute masculine.

Fleiss, while studying the nasal mucous membrane of women, noted definite changes in the nose during menstruation, and furthermore was able to obtain relief of menstrual disturbances through treatment of the nose. He observed definite congestion and exfoliation in the nose in cycles of twenty-eight days, when there was an exhibition of the sex characteristics of the female. In males he found a similar sex cycle of twenty-three and a half days. In a series of female cases he observed, the sex cycle would come every twenty-three days, the female masculine phase, during which time the behavior was of a more

masculine type, when she was more prone to commit crime, and it is claimed that pregnancy during this period is practically impossible. A series of male cases exhibited this phenomenon every twenty-eight days, when they were said to be in their feminine phase, and exhibited definite feminine characteristics. This may account in a measure at least for homosexuality. We had two male patients who had, without apparent cause, bloody discharges from the urethra every twenty-eight days. We also had a number of cases who regularly had conjunctivitis of one or the other eye which occurred about every four weeks, and for which no definite etiology was determined.

Dr. Martin related that while in Europe he came in contact with representatives of homosexual societies who were apparently proud of their bisexual characteristics. They claimed that it was just as normal to be a homosexual as to have red hair. He says they had societies in all the large cities, with a membership of some 40,000 in Berlin alone, also that they had their own club rooms, restaurants, periodicals, and even a small island in the Black Sea wherefrom all women were excluded. Freud assumes that the sex instinct is sublimated or refined into many qualities but apparently he did not recognize the importance of the maternal instinct. In both sexes the sexual, aggressive or masculine, and the maternal, protective or feminine instincts co-exist. Males may exhibit great femininity or females great masculinity, but inasmuch as the sexual instinct is dominated by the sympathetic, and the maternal by the autonomic, it is evident that both cannot dominate at the same time. In the recognition of this fact, we may find the basis for the instabilities and sex perversions of homosexuality, and agree with Berman in that, "the functional hermaphrodite must satisfy two doubly flowing streams of visceral pressure within himself." Nevertheless it would be interesting to know the masochistic motives of a patient who obtains keen sexual pleasure by making himself a human pincushion (Fig. 8).

## HERMAPHRODITISM

In considering the subject of hermaphroditism an embryological résumé may be advantageous at this time. As already stated, in fetal life the sexual apparatus in both sexes is indifferent, therefore neutral, and the germ-plasm designated for the sexual organisms is separate and distinct from that of the body tissue or somatoplasm. From this germplasm develop the sexual progenitors known as the indifferent genital gland, and the Wolffian and Muellerian ducts. The indifferent genital gland originates from the mesothelium of the body cavity and becomes part of the Wolffian body. The latter undergoes proliferation to form the genital ridge which gives rise to the ovaries and testes, from which the mesothelial cells form the "germinal epithelium of Waldeyer," and become the progenitor of the ova and spermatozoa of the future sex. The vas deferens and epididymis develop from the Wolffian duct; from the Muellerian duct, which develops shortly after the Wolffian duct, and which it parallels to the cloaca where both terminate, develop the uterus, Fallopian tubes, and vagina in the female, and uterus and vas deferens in the male. The fusion of both the Wolffian and Muellerian ducts form the urogenital sinus, from which develop the external genitalia of both sexes, any unusual or faulty development of which gives rise to hermaphroditism.

Hermaphroditism is common in both the vegetable and animal kingdom. Humanity begins its existence in the state of hermaphroditism. This condition is found until the end of the second month of the human embryo as well as in the lower animals. After the fourth day, in the chick, the genital gland begins to indicate whether it will be testicle or ovary. In the rabbit, the change takes place on the fifteenth day, and in the human embryo, on the thirtieth day. Hermaphroditism, however, does not occur until the external genitalia simulate one or the other sex.

According to Greek mythology, Hermaphroditus, the son of Venus and Mercury,

was educated by the Naiades who dwelt on Mount Ida. At the age of fifteen, while resting in the cool shades on the woody banks of a fountain and spring near Caria, he was solicited by Salmacis, the nymph of the fountain. His refusal provoked her and caused her to pray to the gods to amalgamate poor Hermaphroditus to her body thereby making them one. Apparently she won the favor of the gods since her request was granted, although the distinct characteristics of each remained unchanged. Thus began the bisexual race of the Androgynes of the ancients.

Remondino<sup>8</sup> claims that the early Franciscan missionaries to California found men of uncertain sex dressed like women. They were thought to be hermaphrodites and were used by the Indians chiefly for pederasty as a part of their dance ceremonies. Hammond also mentions this practice as being in vogue among the Indians of the Southwest. These men were previously eunuchized by persistent onanism. Debierre reports the case of Marie-Madeleine LeFort, whose head was masculine, with a full beard and masculine expression, her chest was covered with hair, yet her breasts were developed and her genitalia were feminine except that the clitoris was greatly hypertrophied. Her development was said to be "sexually that of a perfect woman and she menstruated regularly."

Burden<sup>4</sup> reports a case of a British soldier, aged forty, who served for five years in the British Army and who attended the Mayo Clinic and was examined for recurring attacks of hematuria. For ten years prior to examination he had spontaneous hematuria every four or five weeks accompanied by a distinct pain in the lower abdomen. Physically he was of feminine build, with a light beard and masculine voice, normal penis and scrotum but without testes in the scrotum. The pubic distribution of hair was feminine (Fig. 9). Rectal examination failed to reveal the presence of a prostate or seminal vesicles. In his sex sentiments he preferred male society. A diagnosis of vicarious hematuria with



developmental anomaly of the genitourinary tract, and solitary left kidney, was made. Exploratory laparotomy was advised. An operation was performed at which time the following structures were removed: uterus, tubes, ovaries, testes, epididymis and appendix (Fig. 10). Spermatozoa were demonstrated in the testicular tissue. The patient made an uneventful recovery. Burden states that "this is an

quence, was imprisoned in the ecclesiastical court prison. There was no definite information in either case as to the possibility of autopergnancy.

One of the most interesting cases of hermaphroditism recorded is reported by J. Allen Gilbert.<sup>7</sup> A medical student who went through school as a girl was of a decided dual nature but preferred the masculine. Her sexual nature was both

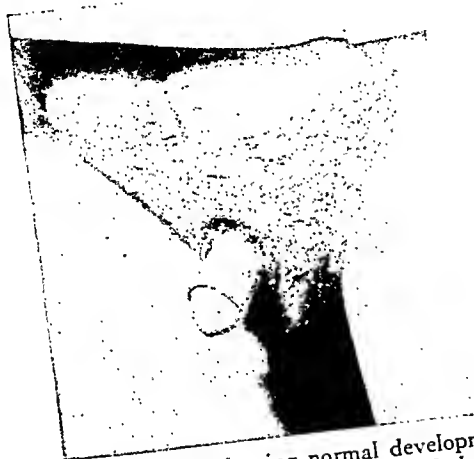


FIG. 9. Pubic region showing normal development of penis and feminine distribution of pubic hair.

instance of the hermaphroditism of bilateral type, as evidenced by the presence of ovaries and testes of both sides. There is also proof of functional activity of the two different genital glands."

A very unusual case of hermaphroditism was that of Hohman of Vienna, who died at the age of forty, and was reported by Rokitsansky. Autopsy revealed two ovaries and tubes, a rudimentary uterus and one testicle. His penis was hypospadiac and the testicle bifid. Both ovulation and spermatogenesis were demonstrated. It is claimed that he copulated with both male and female. Of equal interest was a hermaphroditic soldier of the Hungarian Army who was reported by Montaigne as having been confined of a well-developed infant while in camp. He also reported a monk who was brought to successful accouchement in a convent cell, whereas Duval reports a similar case of a priest in Paris who was found pregnant, and, as a conse-

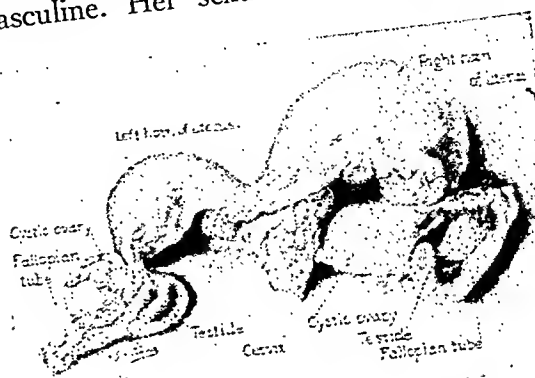


FIG. 10. Structures removed at operation.

male and female and copulation with each was not only possible but also indulged in. She had both male and female sex organs and was pregnant as a woman. Later, at her own suggestion because she wanted to be a male, a hysterectomy was performed. She graduated as a man and married a woman by whom she had three children, all of whom are living. At present she has an active practice, as a man, in a certain western city. Incidentally she was a schoolmate of a colleague of mine who knows her history intimately and who vouches for the verification thereof.

The *Illinois Medical Journal*, February, 1924, page 90, gives an interesting account of an unusual case of a "Man Pregnant with Twins."

Hermaphroditism in the human being can be readily understood when we consider the presence in the human fetus of both the Wolffian body and the Mullerian duct, which fact alone attests to a normal primitive condition of hermaphroditism. According to Bell,<sup>1</sup> "it appears that the determining causes of sex originally pre-

dominate in the direction of the defined nature of the gonads, but that masculinity-producing factors arise at a later period, possibly in the last weeks of pregnancy or soon after birth—and counteract the original femininity-producing influences. Moreover, since we know that every person is bisexual, however masculine or feminine in characteristics, it is probable that in cases such as these, forces producing masculinity are so overwhelming that not only is femininity suppressed and masculinity produced, but even precocious masculinity.”

#### EMASCULATION AND THE SEX CHARACTERISTICS

In the consideration of bisexuality the subject of castration may be apropos. We know that in the case of man double castration before puberty produces feminine characteristics, and the penis remains juvenile. The individual becomes a sterile, impotent eunuch, chiefly feminine in habitus. On the contrary, removal of both testicles from the adult results in immediate sterility, but potency, libido, and the male habitus may persist either for a variable time or permanently.

The Italians allowed their children to be eunuchized for singers in cathedral choirs, as well as to grow up to take female parts in comedies, their voices simulating that of the other sex. On the same principle, the basso-profundos were infibulated that they might retain their bass.

Castration of a young bull will not prevent the growth of the horns, which may even grow longer than in the case of the cow. On the other hand castration of the boar prevents the tusks from developing. In the eland and reindeer, of which both sexes have well-developed antlers, castration does not affect the horns. On the other hand castration of a young male deer, before the antlers begin to develop, prevents their development, whereas if castration takes place in the adult deer after the antlers have fully developed, it results in their precocious shedding. Castration

of the ram of Herdwick sheep causes a cessation in the growth of the horns, but spaying of the female does not result in horn development.

According to Potts, Smith and others, certain male crabs which become parasitized by other crustacea develop female characteristics, but removal of the ovaries of the female crabs does not produce any change. Female fowls and golden pheasants assume in old age the characteristics of the male, as is also the case when female chicks and ducks are spayed. Castration of the Seabright cock causes its female plumage to become like that of the ordinary male, but the plumage of the ordinary rooster is not altered by castration, although the spurs, combs and wattles are not well developed.

Eunuchs have always been considered an essential part of the social life of Oriental countries, hence demand for them has been correspondingly great. Eunuchism may be congenital, or due to accident or design. The classical eunuch is either produced by surgery, usually crude, or the genitalia accidentally removed when young. It is achieved by such practices as using animals to bite off the scrotum and contents, repeated ligation of scrotum, repeated slight trauma of the testicles several times daily, crushing, repeated compressing of testes, and their excessive function to break down the normal testicular substance.

The old pagan priests prepared themselves for a life of chastity and celibacy by soaking the scrotum in hot water followed by frequent repeated compressions, thereby causing the testicle gradually to disappear.

In order to be valuable guards for the Turkish harem, as well as trusted eunuchs for the aristocratic oriental households, complete abolition of the genitalia was required. In most cases this was produced by the *taille à fleur de vente* method, or entire removal of the external genitals by a quick stroke of a razor. Bison states that the mortality by this method was about 90

per cent. The Soudan alone furnished over 3800 eunuchs annually, the material for which was obtained from Abyssinia and neighboring countries, where they were gathered by war, kidnapping parties, and by purchase. The great eunuch factory of that country was a large monastery located on Mount Ghebel-Eter at Abugirgeh where the unfortunate African children were gathered and either simply castrated or had complete abolition of the parts, depending upon the type of eunuch demanded. Inasmuch as there was no attempt to stop the hemorrhage, with the exception of a little styptic powder, the mortality was said to be 9 out of 10. The Coptic monks did a thriving business and furnished Constantinople, Arabia, and Asia Minor with many of the much sought for eunuchs. Remondimo says, "It is estimated that 35,000 little Africans are annually sacrificed to produce the Soudanese average quota of its 3,800 eunuchs."

In Mexico descendants of the Aztecs, the *Mujerados*, were developed for religious purposes. Men between the ages of twenty and thirty-five years were selected and subjected to repeated masturbation several times daily, and compelled to ride horseback, thereby keeping the genitals in a state of constant irritability, thus causing a gradual atrophy of the testes and penis, and the disappearance of pubic hair. Suckling babes were also used to produce marked hypertrophy of the breasts.

Throughout the ages religious fervor and the idea that to be "carnally minded is death" has promulgated the idea that since the sex organs were the basis of carnal-mindedness, entry into the celestial realms meant their subjugation or removal; therefore both the clergy and their devotees resorted to emasculation in order to be fitted for the heavenly kingdom. The Skoptsi of Russia and Lipovans of Rumania, interpreting Matthew 19:12, "For there are some eunuchs, which were so born from their mother's womb and there are some eunuchs which were made

eunuchs of men, and there be eunuchs which have made themselves eunuchs for the kingdom of heaven's sake. He that is able to receive it let him receive it," as a direct commandment for heavenly bliss, emasculated themselves. This sect or cult was started by an ignorant Russian peasant by the name of Andrei Ivanov but got its greatest impetus through the efforts of his assistant Selivanov, a religious fanatic, who was apparently a paraonoiac who proclaimed himself "the Son of God incarnate in Peter the Third," and claimed the title of "God of Gods and King of Kings." Strange to say, although incarcerated in an asylum from which he escaped, he soon had thousands of followers, many of whom were from the noble and aristocratic families of Russia. The Skoptsis are millenians and claim that the world will come to an end just as soon as their number reaches the 144,000 mentioned in Revelation 14:1.

Inasmuch as their religion permits them to have one or two children before mutilating themselves, it would be interesting to get their interpretation of the fourth verse, i.e. "These are they which are not defiled with women for they are virgins," etc., and the application thereof in respect to their religion.

In Smith's Dictionary of Greek and Roman Biographies and Mythology, it is related that Uranos, the progenitor of all the gods, and the first king of Atlantis, was a eunuch. It seems that when Uranos imprisoned his second progeny, the Cyclops, in Tartarus because of their great strength, his wife Gaea became angry and incited her next-born children, the Titans, to rebel against their father. It is related that Saturnus, the youngest son, made a sickle of a diamond and successfully emasculated his father Uranos, thereby deposing him. This made the sea angry so that great commotion took place when the members fell into this element: but it is said that contact of the genitals with the foam miraculously produced Venus, which apparently appeased its anger.

Castration has practically always been a means of punishment for criminals in both oriental and occidental countries. Among certain tribes castration of prisoners of war was commonly resorted to with much the same significance of victory as scalping was with the Indians. At the same time it was a mark of servitude and reduced the prisoner to slavery. The Caribbeans made eunuchs of their prisoners of war on the same principle that caponizing is done today. They found them easier to fatten and more tender when cooked. When the British first found the Hottentots, it was customary with the males to remove one testicle, supposedly for the purpose of enabling them to run more swiftly, but they also had the idea that twins came from two testicles, hence in order to avoid having more than one child at a time one testicle was sacrificed. In case of mixed twins, the female child was smothered, but if there were two boys or two girls, the weaker one was destroyed.

Wheelon<sup>9</sup> and others have made some interesting observations on the effect of castration on prostatic development. In case of white rats, they found that castration not only inhibits development of the prostate but leads to involution of the fully developed gland. Normally in old age, in man, the prostate undergoes atrophy but in a large per cent of cases hypertrophy instead takes place. This, according to Wheelon, is due to an overproduction of the testicular hormone in combination with reduced spermatogenesis. Harrison and White perform and advocate castration as a curative means for prostatic hypertrophy. On the other hand, Remete claims that only normal prostates atrophy as a result of castration, whereas little benefit can be expected from this method in the more hypertrophic types.

#### CONCLUSIONS

Summarization of the more recent observations proves that the secondary sex characteristics do not necessarily depend upon

the secretion of the interstitial cells of the gonads, inasmuch as it has been shown by Pezard and others, that certain forms of animal life with most elaborate secondary characteristics, as for example the golden pheasant, do not possess interstitial cells in their gonads. Until forty years ago the contrary was thought to be the case, but now we know that the sex characteristics are more dependent upon the integrity and normal function of certain of the endocrine glands, and without at least a functioning thyroid, these features are impossible.

We know that the complete sex characters of the male or female have been observed in persons congenitally devoid of gonads, or having gonads of the opposite sex, and frequently observations have shown that the sex characters of the female can be replaced through natural causes by those of the male, even to the replacement of the ovary by a testis. Moreover certain pathological conditions, such as a hypernephroma, will cause arrested ovulation in young girls, and produce atrophy of the ovaries with hypertrophy of the clitoris, as well as changes in somatic development even to the development of a full beard. These and other facts lead us to agree with Belfield that "it is demonstrated that the gonad does not originate sex; that it is less essential to the maintenance of sex than is the thyroid or the suprarenal; and that it is indeed one of a chain of interesting endocrine glands, efficiency in every link of which is essential to normal function, sexual or somatic."

It is evident that some force independent of the gonads enters into the determination of sex which is associated with the chromatin formation in the fertilized egg. It is well known that various types of animal life have definite chromatic factors known as determiners. For instance every cell of the male housefly can be differentiated from the female cells by the number of chromosomes present. Inasmuch as the fertilized egg is the primary structure in which somatic life begins it seems logical to conclude that the fertilized egg not

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only produces the sex gonads but likewise the sex characters. Moreover, inasmuch as during the stage of maturation a blending of equal ratio of male and female chromosomes is essential for the development of the egg structure, the feasibility of bisexuality can be readily seen. Although at first the germ plasma is neutral, it is said to be potentially feminine, but may become masculine by certain factors that predominate during its development. However, at no time is there absolute femininity or absolute masculinity, there being a variable admixture of both male and female sex features in both sexes. A faulty, or cessation of, embryonal development may result in hermaphroditism; hence, not only is each individual potentially feminine but primarily hermaphroditic.

It is well known that changes in these characteristics can be caused by either pathological processes or castration, as seen in the case of the former in the menopause, or in the latter by the failure of antler growth in deer, and that of the tusks in boars, or in the maintenance of the juvenile voice and feminine characteristics of the Italian singer, or choir boy, when castration is performed before matur-

ity, whereas if done in adult life no apparent changes are manifest. On the other hand, in some forms of life, like the gypsy moth, there is no change whatsoever through removal of the gonads. Whether or not the change in sex features through castration is due directly to the loss of the gonads and their internal secretion prompts the query: Are not such changes largely due to changes and imbalance of the endocrine system resulting because of it?

## REFERENCES

1. BELL, W. V. Hermaphroditismus externus femininus, *Am. J. Obst. & Gynec.*, 1925, x, 1778.
2. BERMAN, L. The Glands Originating Personality, N. Y., Macmillan, 1921.
3. BETTS, J. A. Hermaphrodite, *Atlantic M. J.*, 1926, xxix, 686.
4. BURDEN, V. G. True bilateral hermaphroditism with periodic hematuria. *J. Urol.* (Aug.) 1924, xii, 153-158.
5. EDMUNDS, ARTHUR. Pseudo-hermaphroditism and Hypospadias. *Lancet*, 1926, i, 323.
6. FREUD, SIGMUND. Three Contributions to the Theory of Sex, N. Y., Nervous and Mental Disease Pub. Co., 1918.
7. GILBERT, J. A. Homo-sexuality and Its Treatment, *J. Nerv. & Ment. Dis.*, 1920, liii, 297.
8. REMONDINO, P. C. History of Circumcision, Phila., F. A. Davis, 1891.
9. WHEELON, HOMER. Barker's Endocrinology and Metabolism, Vol. 2.



# PATHOLOGY AND TREATMENT OF GASTRIC AND DUODENAL ULCER\*

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IN his Introduction to the Study of Experimental Medicine<sup>1</sup> Claude Bernard says: "Medicine in its advance through the centuries has always been driven into action, and from numberless ventures into the realm of empiricism, has gained useful information;" that is to say, the medical profession has always been confronted with urgent problems, differing in detail perhaps at different times, but fundamentally the same. The thinking members of the profession recognize this and are disturbed constantly by the thought that they must have more knowledge before they can rationally treat their patients, but since patients present themselves with demands for relief, they are "driven into action" and must do the best they can. How true this is of peptic ulcer! Patients suffer from this disease, they ask relief, and it is only fair that we attempt to give it to them, even though we know so little about the disease itself. I say this latter advisedly as anyone with some experience and a study of the literature must know. Practically nothing is proved except that peptic ulcers exist.

There is even some doubt as to whether they are inflammatory, as evidenced by statements in recent literature to the effect that "probably most authors agree that they are inflammatory." It need scarcely be pointed out that inflammation, pathologically speaking, is participation of vessels and exudation, and this certainly appears in most ulcers. From time to time we ourselves have been guilty of publishing descriptions of the pathology, and have commented on the etiology of ulcers upon a number of occasions. We divide them, as do others, into the acute,

the chronic with exacerbations, and the chronic varieties, stating that probably all chronic ulcers begin as acute ulcers, and that all of them at some time or another have acute exacerbations. General descriptions of the criteria on which this classification is based have been given a number of times; they are participation by vessels, as hyperemia, exudation, necrosis of layers extending to variable depths as far as and through the serosa, the formation of granulation tissue, localized acute and chronic peritonitis, adhesions, regeneration of mucosa, and to a less extent, other layers, and various special processes to be described below.

The microscopic findings in fresh ulcers are disappointingly negative; except for a very small amount of round-cell infiltration on the edges there is merely the defect. Even the round-cell infiltration may be lacking, and many acute ulcers appear as though they were artifacts, as though a portion of the stomach wall were punched out to a varying depth, even to perforation, by some sharp instrument. The older the ulcer, the greater the secondary reactive changes of progression and healing by granulation. Young and old connective tissue around the ulcer extends to a greater or less distance from the defect. Macroscopically, acute ulcers without reaction around them are funnel shaped, extending in an oblique direction terraced through the stomach wall. The defect is less in the muscularis than in the mucosa and least in the serosa; but this appearance is lost, the older the ulcer and the more reaction around it. According to some authorities, the funnel-shaped, terraced appearance is due to the arrangement of vessels, but

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according to others it is caused by the action of muscular tension and rubbing as the food passes through the stomach. The base of the ulcer, if acute, is quite clean, but in older ulcers it is likely to be dirty and covered with a layer of necrotic material under which is an edematous, glassy tissue which microscopically is edematous granulation. The absolute depth of the ulcer depends to some extent on the presence or absence of hypertrophic gastritis. If this is present, the mucosa is thicker, and hence the ulcer, if it extends through to the muscularis, is deeper. The edges of the defect may be covered with fibrin, or they may be hemorrhagic, swollen, edematous and spotted; necrosis indicates progression of the ulcer.

The sites of predilection in the posterior wall, along the lesser curvature and in the pyloric region, have given rise to the opinion that these parts of the stomach are poorer in vessels, or that the vessels are particularly tender, and that the musculature, being particularly powerful, compresses the vessels as it contracts.

Primary or acute perforation is said to occur when one of the acute varieties penetrates immediately and directly through the coats without much ado. More marked contractions or overfilling of the organ may complete a tear in the serosa when an ulcer has extended to that membrane. Such perforative openings are usually small and typically rounded or oval, with sharp edges, looking as though a piece had been punched out with a sharp instrument. Secondary perforation is said to occur when an ulcer is old and chronic and when acute exacerbations have led to more and more destruction of tissue until finally perforation takes place. In this case, however, there are likely to be adhesions to the neighboring parts and so the immediate danger of general peritonitis is avoided, with the exception of ulcers in the anterior wall of the stomach where adhesions are not so likely to occur and in which generalized peritonitis is the usual result. Such organs as the liver (left lobe),

the spleen, pancreas, etc., stop the spread of material from a perforated ulcer, and encapsulated abscesses may occur in these neighborhoods. Very frequently the pancreas is found in the base of a chronic ulcer on the posterior wall. Curiously enough, the pancreas seems to be quite resistant to the digestive action of pepsin, but the surface of the pancreas at the base of the ulcer is covered with a plastic exudate, and the granular, nodular, yellow pancreatic islands are separated by cicatricial bands. This is easily mistaken for carcinoma. Rarer perforations are those through the diaphragm, into the gall bladder, externally through the abdominal wall, into the intestine, into the duodenum or into the colon.

A curious circumstance occurred recently in the Lankenau Hospital. On May 5, a man presented himself to the roentgen-ray department for study because of stomach trouble of several years' duration. His history was not typical of ulcer. On the morning of his arrival he endured a mild pain. He had taken a cathartic the night before, and had eaten no breakfast in preparation for roentgen-ray study. He was already in the fluoroscopic room and had a glass of barium in his hand about to swallow it, when he was seized with very severe pain in the upper abdomen. He placed the barium to one side and sank into a chair. The pain grew worse. He became very sick and about one hour later was operated upon and a perforated ulcer was found on the posterior wall of the first portion of the duodenum. Had he taken the glass of barium, it is probable the heavy weight of the drug would have been blamed for the perforation. It was lucky that he had been prepared, so to speak, for operation, and that his perforation took place at a time where no delay was experienced in rendering the prompt surgical measures that were necessary and that the barium had not emptied into his peritoneal cavity through the perforation. He is recovering without complications.

Hemorrhages in gastric ulcer may be small and repeated or large and repeated or small and single or large and profuse, but they are rarely fatal.

On April 14, 1927, a girl, twenty years old, came to the Medical Ward of the Lankenau



Hospital for treatment for several attacks of hematemesis. On admission the presenting symptom was mild pain in the chest, below the breast, and mild indigestion which, however, was not particularly significant. The blood count was r.b.c. 5,000,000; w.b.c. 15,000; hemoglobin 95 per cent. On April 22, hemoglobin fell to 70 per cent; r.b.c. to 3,400,000, and w.b.c. to 12,000. The following day she vomited a large amount of bright red blood, and digested blood was found in the stools. The red blood cells fell to 2,000,000. The patient was transfused three times with some improvement in the blood picture but none otherwise. On April 27 it was agreed in consultation with the medical staff that operation alone could save the patient's life. A huge, cratered, calloused ulcer was found in the first part of the duodenum, on the posterolateral internal wall. The ulcer was oversewn and a posterior gastroenterostomy performed. The patient died the following day.

In contrast to this, at about the same time, we had 3 similar cases, in which operation was done early and the outcome was favorable. While small hemorrhages are very frequent in the course of chronic ulcer, larger hemorrhages occur chiefly from erosion of larger arteries in the base of an ulcer, in the stomach wall itself, or even in a neighboring organ. Sometimes the ulcer is very small. Quite often the actual vessel cannot be found when the specimen is removed, unless injections are resorted to. Sometimes the conditions for rupture are prepared by a profuse round-cell infiltration disturbing the nutrition of the tissue so badly that necrosis occurs followed by hemorrhage. We have seen rupture of a small aneurysmal dilatation. If a branch of the coronary artery is opened, there is bleeding from both sides, since all of the arteries of the stomach anastomose.

As far as healing is concerned, it has been our experience, fortunately or unfortunately, that of all the operative specimens we have encountered, not one has been completely healed. Of course, many of the patients were operated on for acute symptoms when healing of the ulcer was

not to be expected. But in many instances operation was done in one of the intervals of attacks of pain so well known to the clinician. Also a certain number of ulcers were discovered when the diagnosis was something else, and a certain number of retractions or scars or other evidences on the serous coat of the stomach or duodenum were encountered and excised. Among the latter, we would expect to find healed ulcers, but this has not been our experience. We have always found a defect, sometimes small, sometimes large, but plainly demonstrable. We believe that complete healing can take place, but our experience has been that healing is incomplete, i.e., the ulcer heals to a certain limit but not quite completely, and then breaks down again. Study of some of the autopsy material of the hospital (500 cases) has failed to demonstrate the number of ulcers and healed scars in the duodenum and stomach reported by other observers.<sup>2</sup> This is possibly fortuitous, but we enjoy basing our opinions on what material we have. Most authors agree that if an ulcer has once penetrated the muscularis, perfect healing cannot take place and a scar necessarily results. Others believe that mere destruction of the muscularis mucosae precludes healing *ad integrum*. However this may be, we cannot help feeling that certain ulcers must heal completely and leave no trace.<sup>3</sup>

We believe it hazardous to draw conclusions as to the incidence of ulcer or the presence of a previous ulcer, from finding a scar in the stomach or duodenal wall, and even more hazardous to draw the conclusion that no ulcer was present because no scars are found. It is in just those scars described in the literature as being pulled in, that we have always found a defect. Any scars sufficient to change the shape of the stomach into the hour-glass type, or a stenosed, dilated, shortened lesser curvature, saccular or diverticulum-like ectasia have been found to be incompletely healed ulcers; in fact most of them were active.

As to carcinoma and ulcer, it may be said that the exact number of ulcers that become carcinomatous, and the exact number of carcinomas that were previous ulcers cannot be determined. Since reparative processes are occurring all the time in ulcers, we are faced with the problem of deciding between regeneration and tumor formation, which is an age-old problem. As we have stated a number of times, it is impossible to tell what would have happened had the surgeon not removed the piece of tissue. Ideally, we might diagnose beginning carcinoma in an ulcer when one portion of the circumference shows unquestioned malignant change and the other portions do not. But when carcinoma is present all around the circumference and extending into the surrounding tissue, it is impossible to say that it was not an ulcerating carcinoma from the beginning. We have been fortunate enough to obtain several specimens showing early carcinoma in one part of the circumference of a gastric ulcer. One of these cases was illustrated in a previous article.<sup>4</sup> Again, as we have already stated, the history may be of some help, making due allowance for the difficulties of diagnosis. If a patient has had typical symptoms of peptic ulcer for years and then has an exacerbation of symptoms which refuse to yield to treatment, and if he is then operated on and an ulcerating carcinoma is found, it is possible that the patient had an ulcer which became carcinomatous. But judgment on this point is precarious. From the practical point of view we do not see any reason for absolute percentages at the present time in view of the difficulties of decision. It is sufficient to know that a certain number of ulcers become carcinomatous and on this point there are only a few dissenting voices. In previous communications, we have attempted by history and pathological findings to say that the incidence of carcinoma in ulcers was 30 to 35 per cent. This is probably too high; nevertheless, the case previously referred to and several since have con-

vinced us beyond doubt that the change does occur, and to our minds this is sufficient to render it desirable to remove ulcers surgically that fail to show a proper tendency to yield to other treatment within a reasonable time.

Thus far, we have said nothing of the etiology. We now assert with confidence that the etiology is not uniform but is varied. As the years pass, we feel strengthened in our position that the most useful way to regard peptic ulcer is to look upon it as a "secondary" disease. We thus do not focus our attention entirely on the stomach but pay attention to other parts of the body. Infection as a cause is championed by many authors. We feel that they are correct in many cases but we add the remark that there is no specific organism of peptic ulcer and that the finding of streptococci, staphylococci, colon bacilli, thrush organisms, etc., is not sufficient to identify them as the cause. They may be secondary invaders.

The hydrochloric acid and pepsin of the gastric juice are important factors, if not in the formation of ulcers, at least in their progress and their refusal to heal. Indirect evidence of this is seen, in addition to other facts, in the presence of islands of gastric mucosa in a Meckel's diverticulum and in which a typical ulcer is present.

The etiologic rôle of the nervous system and sympathicotonia is far from settled, although without doubt they are very important.

Factors such as mechanical sagging of the stomach, spasticity, arteriosclerosis, etc., are certainly among the etiological agents. The irritation or rubbing of food passing through the stomach is probably also a factor; for example, calves with a "rennet" stomach develop ulcers if fed coarse food before the rest of the stomach is developed. Recently Shapiro and Ivy<sup>5</sup> have presented some interesting work in which this mechanical rubbing of food is said to play a part. Rubbing of foreign proteins into the mucosa produces an

hypersensitivity and the rubbing in of the same proteins some time later in the same area, leads to a local anaphylactic phenomenon which causes tissue destruction and the presence of an ulcer. This fact brings ulcer in relation to immunity, i.e., to the problems of local immunity which are attracting attention in other fields at the present time.

To sum up our opinion of peptic ulcer at the present time: we believe it is a secondary disease, that infection is the most important etiological factor, that the gastric juice is important in maintaining chronicity, and that in any given case all sorts of causes should be sought for and eliminated in the medical treatment of duodenal and gastric ulcer and in the postoperative treatment when the ulcer has been removed.

Let us now turn our attention to the treatment of peptic ulcer. The answer to the natural question, shall it be medical or surgical, depends to some extent, at least, on the questioner. Both methods have their advocates and both claim a certain percentage of cures. Aside from my [Deaver's] prejudice, if you wish to call it that, in favor of surgery, there are certain indisputable facts that should have great weight in considering this aspect of our subject.

Enough has been said about the potential malignancy of gastric ulcer to establish the necessity of surgery for this form of peptic ulcer. Duodenal ulcer, on the other hand, as is well known, presents the possibility of hemorrhage or perforation.

The incident cited in the earlier part of this paper sufficiently illustrates the dangers of bleeding ulcer, and at the same time shows how insidious these apparently symptomless cases are. It has been estimated that bleeding occurs in from 50 to 80 per cent of all ulcer cases and that it proves fatal in from 3 to 11 per cent.

Perforation, on the other hand, occurs in about from 9 to 14 per cent of duodenal ulcers and the mortality depends on the time elapsing between operation and the

first symptoms of perforation. Eleven per cent is the approximate average in our experience. The mortality in the interval operation for chronic ulcer is only about four per cent.

With these facts in mind, one must come to the conclusion that whatever its advantages, medical treatment may often prove merely temporizing, to say the least. A good working rule is that the ulcer patient who fails to show decided improvement after one or two series of medical treatments should be confronted with the advisability of surgery.

The type of surgery will, of course, depend on the personal preferences of the surgeon, and on the presenting conditions. While gastrojejunostomy plays a prominent rôle as a surgical procedure it is not the only one at the disposal of the surgeon. According to the exigencies of the case, such as size and location of a duodenal ulcer and other concomitant conditions, he may merely excise the ulcer, or do a pylorotomy or a pyloroplasty or even a subtotal gastrectomy. Indeed, wide resection is at present being strongly advocated, especially among European surgeons. It may have something in its favor, but until sufficient data are at hand to prove that the more radical operation reduces the incidence or obviates the development of marginal ulcer, the most serious sequel of gastrojejunostomy, there seems no very valid reason *per se* for extensive gastric resection for duodenal ulcer. The treatment of gastric ulcer, however, is a different matter. Here radical operation is the indicated procedure, principally because of the possibility of carcinomatous changes inherent in a certain percentage of such ulcers.

Excision of a small duodenal ulcer is the simplest, and would be the ideal operation if it positively insured the patient against future ulcers, and if it were not for extensive and troublesome adhesions which may form after the operation. For these reasons it is often advisable to supplement excision by a posterior gastro-

jejunostomy. The small duodenal ulcer on the anterior or anterolateral wall can be treated by excision with a cataract knife or by perforation with the cautery (Balfour operation) and closure of the perforation, followed by posterior gastrojejunostomy. For a large ulcer on the anterior or anterolateral or posterolateral wall of the duodenum, or a large or small ulcer on the posterior wall, gastrojejunostomy alone may suffice in some cases; others, especially ulcer of the bleeding type, require excision of the ulcer, if possible, or a pylorotomy including amputation of the duodenum and gastrojejunostomy. The results of these methods, however, are sometimes minimized by the fact that operations at the pylorus either do not always effectively reduce gastric acidity, or if reduced, the reduction, the great desideratum of the operation, is not maintained. Posterior gastrojejunostomy alone is indicated when the ulcer is located low down on the duodenum close to the head of the pancreas, as well as for ulcer obstructing the pylorus or the terminal duodenum. The latter, fortunately, is rare.

Gastric ulcer is not only a more serious condition than duodenal ulcer, but also, as already indicated, is generally not amenable to the more simple operations. When, however, a small ulcer is found on the posterior wall of the stomach, excision through an anterior gastrotomy may suffice. The so-called saddleback ulcer, whether or not associated with hour-glass deformity of the stomach, will require sleeve-resection, while a larger ulcer with extensive induration demands the more radical operation of subtotal gastrectomy. A valid reason, probably the most valid reason for the procedure, is the potential malignancy of gastric ulcer, no matter whether it is low or high, and since it is not possible to determine, except by microscopic examination, whether or not a given ulcer is malignant, nor which ulcers will and which will not undergo carcinomatous change, the safest method is

wide resection both as a curative and as a prophylactic measure. Sleeve-resection combined or not with a posterior gastroenterostomy is not a popular operation with many surgeons, but in our experience it has given most satisfactory immediate and remote results in selected cases.

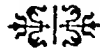
A subtotal gastrectomy may be completed by bringing a short loop of jejunum through an opening in the transverse mesocolon and making an end-to-side anastomosis with the cut end of the stomach, or a long loop may be brought over the great omentum and transverse colon and joined to the end of the stomach; in this procedure an enteroanastomosis should always be made at the bottom of the two loops to prevent the development of a vicious circle. The first is known as the Polyá, and the second as Balfour's modification of Polyá's operation. The advantage of the long-loop operation is that in the event of marginal ulcer necessitating a subsequent operation, the surgeon will have a larger section of bowel at his disposal for making a new anastomosis. A subtotal gastrectomy may also be completed by closing the proximal end of the stomach and making a posterior gastroenterostomy (Billroth II); or, when conditions permit, a direct anastomosis may be made between the cut ends of the stomach and duodenum (Billroth I). Sometimes I [Deaver] have obtained very satisfactory results from the Moynihan anterior short-loop gastroenterostomy, in which the open end of the stomach is anastomosed to the side of the jejunum not far distal to its origin.

Having dwelt on some of the disadvantages of medical therapeutics, it is only fair to call attention to the complications that may follow surgery. The most unpleasant and disheartening of these is, of course, marginal ulcer, which as we all know has the same inherent possibilities of hemorrhage and perforation as pertain to the primary condition. The incidence of marginal ulcer varies from 1 to 3 per cent. The cause may be faulty technique, or it may

be due to ulcer diathesis, that is, the persistence of hydrochloric acid. But whatever its cause, its incidence helps to keep the surgeon humble. The treatment of marginal ulcer is eminently surgical. The best procedure, is to undo the anastomosis and to perform a gastric resection, either a sleeve operation or a subtotal gastrectomy.

## REFERENCES

1. BERNARD, C. An Introduction to the Study of Experimental Medicine. Translation. by H. C. Greene, N. Y., MacMillan Co., 1927.
2. STURTEVANT, M., and SHAPIRO, L. L. Gastric and duodenal ulcer (autopsy statistics of various kinds). *Arch. Int. Med.*, 1926, xxxviii, 41.
3. CROHN, B. B., WEISKOPF, S., and ASCHNER, P. W. The healing of gastric ulcers. *Arch. Int. Med.*, 1926, xxxvii, 215.
4. DEAVER, J. B., and REIMANN, S. P. The surgical treatment and the pathology of gastric and duodenal ulcer. *Surg., Gynec. and Obst.*, 1921, xxxii, 103-111.
- DEAVER, J. B., and REIMANN, S. P. *Excursions into Surgical Subjects*. Phila., W. B. Saunders Co., 1923, pp. 1-51.
5. SHAPIRO, P. F., and IVY, A. C. Gastric ulcer; experimental production by local anaphylaxis. *Arch. Int. Med.*, 1926, xxxviii, 237.
6. For extensive literature see KARSNER, H. T. Pathology of peptic ulcer of the stomach. *J. Am. M. Ass.*, lxxxv, 1376.



## [SURGICAL SUGGESTIONS]

IN a case of hepatic duct lithiasis and especially in the occasional case of stone formation in all the ducts, it is wise not to remove the gall bladder, even though it contains stones—unless it is too diseased to leave in place. Such a patient, usually female, is a “stone former” and there is no assurance that she will not again produce calculi in her bile-ducts. As a result of these, or of operations for their removal, her common duct may become so seriously damaged that the gall bladder may be needed to establish bile passage into the duodenum by anastomosis therewith or with the stomach.

AFTER cholecystectomy a very small tube drain is all that is needed to provide for possible escape of bile from the ligated cystic duct. It is a good device to stitch the tube with fine plain catgut to the duct stump, distad to the ligature, to prevent the tube from being displaced while the abdominal wall is being closed.

# THE DUODENOGRAM APPLIED TO THE DEMONSTRATION OF A DUODENOJEJUNAL DIVERTICULUM

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THE roentgen demonstration of lesions of the duodenojejunal junction is ordinarily difficult because this region is overlapped by the barium-filled stomach. By means of the duodenogram an outline of the entire duodenum, including the

whether the beginning of the perforated portion corresponds to the beginning of the duodenum. After the position of the tube has been localized by fluoroscopic examination and the end is beyond the duodenojejunal junction a thick barium

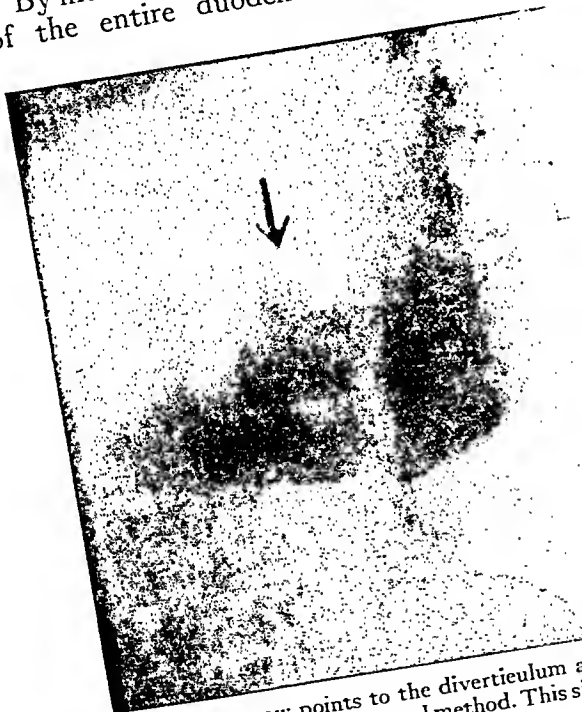


FIG. 1. The arrow points to the diverticulum as noted by means of the ingested meal method. This simulates a perforating gastric ulcer.

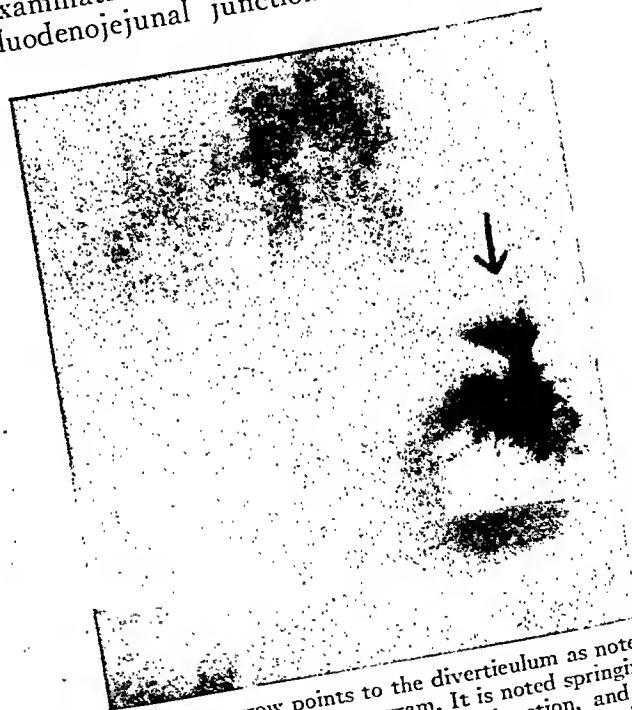


FIG. 2. The arrow points to the diverticulum as noted by means of the duodenogram. It is noted springing directly from the duodenojejunal junction, and is clearly differentiated from a possible perforating ulcer of the stomach.

duodenojejunal junction, may be obtained, unobscured by the stomach. This is done in the following manner: A duodenal tube is swallowed until the end reaches beyond the duodenojejunal junction. The last 10 inches of the rubber tube contain numerous perforations. This perforated portion is joined to the remainder of the tube by means of a small metal connecting piece. This is done so as to ascertain

suspension is injected through the proximal end. On reaching the numerous perforations in the distal portion of the tube, the barium escapes through these fairly simultaneously. The entire duodenal curve, including the duodenojejunal region, is thus completely filled with the barium suspension. A roentgenogram is obtained immediately. In this way, the entire duo-

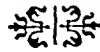
denum including the duodenojejunal junction is visualized, without being obscured by the overlying barium-containing stomach.

It is reported that duodenal diverticula occur much more frequently anatomically than radiographic findings would indicate. The difficulty of clearly visualizing the entire duodenal curve by the ordinary method of first filling the stomach may partly account for this discrepancy.

A duodenojejunal diverticulum may simulate a perforating gastric ulcer, when it occurs in close proximity to the lesser

curvature. Haudek has referred to this possible confusion.

By means of the duodenogram, it is possible to differentiate clearly between a diverticulum and a perforating ulcer in a doubtful case. Figure 1 represents the appearance of the diverticulum, as noted by the ingested meal method, simulating a perforating ulcer of the lesser curvature. In Figure 2 by means of the duodenogram the origin of the diverticulum is clearly demonstrated as springing from the duodenojejunal junction.



#### [SURGICAL SUGGESTIONS]

CHRONIC stasis and dilatation of the duodenum involving the third portion, and produced at or by the passage over the gut of the superior mesenteric vessels, is a real entity, anatomically and clinically. Although the condition is one that is mostly found in viscerototics who are, or who are usually accused of being, neurotic it sometimes causes such severe symptoms, persistent vomiting and loss of weight, as to require operation.

WHEN the duodenum is much dilated duodenojejunosomy is easy and is the best operation for chronic duodenal obstruction. Gastrojejunosomy does not meet the indications and, in such cases, plication of the gastrohepatic omentum cannot be depended upon to overcome obstruction.

IT IS well to remember that a gas gangrene infection may occur in tissues more or less gangrenous from other causes, e.g., arterial disease. A penetrating and unusually offensive odor of putrescence and the escape from the tissues of a few bubbles of gas are significant of this infection.



# BLEEDING FROM THE GASTROINTESTINAL TRACT CAUSED BY BENIGN POLYPOID TUMORS: REPORT OF CASES

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WHEREAS the common lesions of the stomach, ulcer and carcinoma, are recognized with a fair degree of certainty, the more unusual benign tumors commonly pass unnoticed and very frequently are first discovered either at operation or necropsy. One of the reasons for this has been that because of their comparative rarity, benign tumors of the stomach are usually not considered in the differential diagnosis; and when ulcer and cancer seem to be excluded from the clinical picture, the cause for the anemia is usually sought for in other channels. Unfortunately, many cases of secondary anemia reach a severe state because of failure to thoroughly investigate the stool for blood. Although commonly the source of the bleeding from the gastrointestinal tract can be found, there are cases in which, after a most thorough and careful study, even exploratory operation fails to reveal the bleeding point. These cases are of special interest because the outcome is almost entirely dependent upon accurate diagnosis; the location of the lesion having been found, the procedure is relatively simple and leads to the complete recovery of the patient.

The location of the bleeding point must be determined by a process of exclusion. The unrecognized cases of severe secondary anemia developing from bleeding hemorroids are still too frequent. This source should be immediately excluded. Polyps in the rectum and sigmoid should be excluded by proctoscopic and sigmoidoscopic examinations. The upper respiratory and digestive tract should be investigated and varices of the esophagus excluded.

In this manner the zone of possibility becomes gradually narrowed.

Balfour and Henderson<sup>1</sup> report 38 cases of benign tumors of the stomach that have come to operation in the Mayo Clinic. Fourteen of these were fibroadenomatous polyps, 23 were fibromas, myomas and myxofibromas. There were 4 hemangiomias and 4 cases of gastric polyposis. They regard anemia as the most frequent as well as the most important sign. An acute secondary anemia from gross hemorrhage occurred in a number of cases. The only physical findings suggestive of benign tumor occurred in those cases in which the tumor was large enough to be palpated. Differential diagnosis was dependent upon fluoroscopic examination. In 92.6 per cent the roentgenogram revealed the lesion. In the treatment they employed blood transfusions freely and operated under local anesthesia when necessary. The procedure used was transgastric removal through an incision in the anterior wall of the stomach, and division of the pedicle by cautery. In the large tumors partial gastrectomy was necessary.

It is stated that confirmed cases of gastric polyposis are comparatively unusual, although reports of isolated cases of the disease have appeared from time to time in the literature. One writer has found only one case of gastric polyposis in 8000 gastric lesions, another found 14 cases of gastric polyps in 600 necropsies, and collected 8 others from the earlier literature.

DuBray<sup>2</sup> is of the opinion that the disease is more frequent than the reports mentioned above would indicate. He

believes that some of the obscure conditions of the stomach, masquerading under such diagnosis as chronic gastritis, gastric neuroses, etc., might, on further investigation, prove to be benign tumor conditions of the gastric wall. While there are several varieties of benign tumors of the stomach, DuBray says it is safe to assume that, of the primary forms, the polyadenomas and papillomas form the important clinical groups. He adds that two varieties of gastric polypoid conditions have been described, depending on whether the ducts

stools, and the patient shows signs of chronic secondary anemia.

Bassler<sup>3</sup> states that in the large pedunculated growths the polyps may act as a ball-valve, more or less completely occluding the pylorus. The diagnosis may sometimes be made by noting detached polypoid fragments in the stomach washings. When extensive polyposis exists, achylia is usually present. In one of Bassler's cases, gastroscopic examination shows the entire lining of the stomach covered with polypoid masses.



FIG. 1. Photomicrograph showing benign adenoma. The glands are hypertrophic but the cells show no atypical changes.



FIG. 2. Photomicrograph showing beginning adenoma malignum. There is marked overgrowth of the glands. The cells are atypical. One minute focus shows beginning infiltration.

or the fundus of the gastric glands are involved. When the ducts principally are involved, the tumor is distinctly lobulated, and cysts are more common; but when the alteration is chiefly in the fundus there is little or no lobulation, and the cysts are either few in number or entirely absent. He also believes that there is nothing pathognomonic in the symptoms of gastric polyposis, but at times, certain suggestive evidences of the disease are noted. Many of the cases are discovered only at autopsy, and this fact demonstrates its frequently silent nature. At times, however, occult blood is found in the fasting contents of the stomach and in the

According to Bryan,<sup>4</sup> certain investigators believe that polypoid tumors of the stomach develop on the bases of chronic inflammation; and one writer has conclusively demonstrated the gradual transition from gastritis through adenoma to carcinoma.

#### CASE REPORTS

H. S., unmarried female. Symptoms began in 1909 when she was thirty-three years of age. There were spells of pallor, vertigo and syncope. There was an occasional attack of enteritis. In 1911 a gastroenterostomy was performed for a supposed peptic ulcer which had evidenced itself by epigastric pain and melena. This

# Marcus—Polypoid Tumors

operation failed to relieve her symptoms and bleeding persisted.

In 1915 there were marked weakness, pallor, loss of weight, hematemesis, melena and mucus in the stools. The heart and lungs were negative. She complained of epigastric pain and tenderness. The gastric contents after the Ewald aspiration showed a free hydrochloric acidity of 0 and a total acidity of 5. The hemoglobin was 60 per cent (Sahli). The stool was positive for occult blood. She lost 11 lbs. in weight.

The x-ray examination at this time showed a slight delay of barium through the cardia with a cauliflower defect at the cardiac half of the posterior wall of the stomach. There was a patent stoma and the stomach was completely empty in four and one-half hours. A strict dietary régime failed to improve the patient's condition. There was gradually increasing weakness and pallor and occasional severe attacks of hematemesis and melena. In 1918 her condition became critical and the patient was sent to the hospital. Repeated gastrointestinal hemorrhages reduced the hemoglobin to 32 per cent and transfusions were resorted to.

On November 15, 1918, a laparotomy was performed. The stomach was opened and a large cauliflower-like papillomatous growth involving the posterior wall of the cardiac half of the stomach was found and removed. The patient made an uneventful recovery and gradually regained her weight and strength. All symptoms were completely relieved. Examined on March 22, 1927, she had held her former weight, her hemoglobin was 84 per cent, and her general condition was excellent.

I am informed of another case of interest in this connection illustrating the same difficulties in diagnosis, in which the lesion was found in the small intestine:

Female, aged nineteen, has had a moderate grade of anemia for seven years, during which time she had been treated under various diagnoses. Four years ago blood was first found in the stools, but no definite lesion in the gastrointestinal tract could be demonstrated in spite of careful examinations. For a period of six months before admission, bleeding from the gastrointestinal tract became so marked that the hemoglobin fell to 23 per cent (Sahli). The persistent bleeding from the gastrointestinal

tract and the continued downhill course of the patient necessitated a prompt exploratory operation to determine the source of the bleeding. This was done under local anesthesia, after blood transfusion. The general condition of the patient contraindicated a complete exploration of the entire gastrointestinal tract. A small nodule which did not feel like an ulcer was palpated on the posterior wall of the stomach near the pylorus. This nodule was excised and gastroenterostomy was performed. The patient made an uneventful recovery from the operation, but blood in the stools persisted and the hemoglobin again fell to 20 per cent. After two more blood transfusions it was decided, on consultation, that in order to prevent death from hemorrhage a second exploratory operation was urgent.

At the second operation the gastroenterostomy was found in good working order. The ligament of Treitz was located and palpation of the entire length of the small intestine was begun, gradually withdrawing and replacing the loops of bowel. When the middle portion of the ileum was reached a firm mass was discovered in the lumen. Incision in the intestine exposed this mass, the size of an English walnut, attached by a narrow pedicle to the wall of the intestine. The surface was granular, ulcerated and bleeding. The tumor, which proved to be a benign polyp, was easily removed with the cautery and the ileum was closed with interrupted sutures. The patient made an uneventful recovery. Repeated examinations of the stools for blood were negative. The hemoglobin gradually returned to normal.

## DISCUSSION AND CONCLUSIONS

1. Persistent bleeding from the gastrointestinal tract is frequently caused by benign tumors of the stomach or intestines.
2. The common benign tumors in the stomach and intestine which give rise to persistent bleeding are the papillomas and adenomas.
3. The detection of these lesions is frequently difficult because of lack of physical signs; and, in the small intestines, because of negative roentgenographic findings.
4. The most thorough diagnostic methods may fail to discover the source of the bleeding and even exploratory

laparotomy, when not complete, often fails, to locate the lesion.

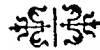
5. In all cases in which the source of persistent gastrointestinal bleeding has been narrowed down to the stomach and intestines, early exploratory laparotomy is indicated. The chances for recovery are improved by preoperative and postoperative blood transfusion when necessary, and the employment of local anesthesia where practicable.

6. At operation there should be no hesitancy in opening the stomach in search for the bleeding point. One of the cases cited illustrates the importance of carefully exploring by palpation the entire length of the small intestine for the source of bleeding.

7. Malignant changes in single papilloma or adenoma of the stomach or intestine may occur and this furnishes an additional indication for early detection and removal.

#### BIBLIOGRAPHY

1. BALFOUR, D. C., and HENDERSON, E. F. Benign tumors of the stomach. *Ann. Surg.*, March, 1927, lxxxv, 358.
2. DU BRAY, E. S. Gastric polyposis (papillomatosis). *Arch. Int. Med.*, 1920, xxvi, 221.
3. BASSLER, A. Diseases of the Stomach and Upper Alimentary Tract. Phila., F. A. Davis Co., 1926, pp. 754-755.
4. BRYAN, L. Gastric polyposis. *Southwest. Med.*, June, 1922, vi, 223.
5. MONAT, T. B. Two cases of polypus of stomach. *Brit. J. Surg.*, 1925, xiii, 165.
6. NOVAK, E. Polypoid adenoma of the stomach. *J. Am. M. Ass.*, 1920, lxxiv, 871.
7. SUTHERLAND, C. G. Polypoid tumors in the pyloric end of the stomach. *Radiology*, 1926, vi, 520.



#### [SURGICAL SUGGESTIONS]

A MILD and limited gas gangrene infection may at any moment take on a fulminating and rapidly fatal course.

I N acute osteomyelitis, extensive gutter osteotomy is not necessary, and scraping out the cancellous bone is to be severely condemned. Drainage can be provided through drill holes (trephinage) of sufficient size and number, or through bipolar trephinage, and suppurating medullaris may be adequately evacuated with gauze wipes or irrigation, or may be left to drain out.

# ACUTE ABDOMINAL DISASTERS

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UNDER this title I mean to include those pathological processes within the abdomen which, if not combatted by the surgeon, will surely result in death. I wish to exclude those diseases that are distressing and in a measure dangerous but in which the attendance of the surgeon is not emphatically required.

Some surgeons are satisfied to make a diagnosis of an acute surgical condition within the abdomen, allowing the details to be worked out after the abdomen has been opened. Unfortunately, often this is the best we can do but, if possible, an accurate diagnosis should be made, for on this the proper planning of the operation rests. If the incision is improperly placed additional trauma must be inflicted and additional time consumed. If local anesthesia is to be used an accurate diagnosis is imperative. In fact local anesthesia is contraindicated unless the surgeon is reasonably sure of his topographic diagnosis.

Since even after exhausting our diagnostic skill we may be mistaken, the operation partakes more or less of the nature of an exploration. Unless one has a clear understanding of the relation between the pathological condition and the symptoms he may still be confused after the abdomen is open. The surgeon must know, once he has the lesion in hand, whether or not it is responsible for the patient's complaints. During the years I engaged in pathology it was nothing unusual to perform an autopsy after the surgeon had operated on the wrong thing.

I propose, because of this experience, to discuss the diagnosis after the abdomen is open as a supplement to the clinical discussion. I shall divide the abdominal disasters into two groups: First, the perforative group, which includes the diseases or trauma of the hollow viscera, the stom-

ach and duodenum, the appendix, the gall bladder, and the intestines, small and large. Second, the thrombotic group, in which there is no solution of the continuity of the visceral wall resulting in an acute general peritonitis as obtains in the first group but there is injury to the walls due to disturbance of the circulation. In this group is included those conditions in which circulation of the blood is interfered with. Acute pancreatitis, intestinal obstruction, thrombosis of the mesentery, tumors with twisted pedicles, hemorrhage into a cyst or tumor, gangrene of the appendix and the like make up this group.

I group the disasters into these two divisions because I wish to emphasize the fundamental pathology in the beginning of the symptoms. In the perforative type the initial pain is due to the irritation of the gut wall and parietal peritoneum by the escaped contents. The peritonitis appears later and dominates the field. In the second group the pain is due to the presence of clotted blood. It is the pain of dying tissue. Profound constitutional disturbance is and remains the chief factor in pancreatitis, intestinal obstruction, in fact any injury in which extravasated blood plays a part. Inflammation follows after a time, but rarely suppuration unless, indeed, perforation follows as the result of gangrene.

I want to emphasize at the outset that in the diagnosis of abdominal disasters one must consider the time that has elapsed since the onset of the disease. If seen in the first few hours the picture is quite different from that we encounter after a duration of many hours or several days. One must have a thorough understanding of the life history of the disease in order that one can diagnose the condition at the time the patient is first seen.

It is necessary to secure a clear under-

standing of the earliest symptoms in order to determine the point of beginning and therefore an idea of the organs involved. Generally speaking, the point of maximum pain at the outset will indicate the organ which is the seat of the disease. After some time has elapsed the infection may spread, and with this spread the picture may change.

In the perforative group, in which the important factor is the ensuing infection, the incision must be placed at the site of the lesion; otherwise the infection will be carried to non-infected regions, thus adding much to the burden the patient must bear. On the other hand, in the thrombotic group we are not dealing with an infection but with a disturbance of the mechanics of the circulation. We may carry the affected region across the abdomen without adding to the burden the patient has to bear.

*Diseases Outside the Peritoneal Cavity Simulating Intra-abdominal Diseases.* Before beginning the discussion of the two groups above enumerated it is necessary to consider those diseases from which the disasters must be differentiated. Confronted by what appears to be an acute surgical disease of the abdomen I always ask myself, "Is the trouble really in the peritoneal cavity or is it an extraperitoneal disease? If it is within the peritoneal cavity, is it one of the surgical disasters or minor acute abdominal pain?" In this group I would include gall-stone colic, acute appendicitis, tubal abortion and less common affections of like severity. If it belongs to this group I allow my assistants to work up the case and look at the evidence later. If the condition is one belonging to the abdominal disasters, the problem must be solved at once.

We may first consider the extra-abdominal diseases that may simulate abdominal crises.

*Thoracic Disease.* Diseases within the chest may produce pain referred to the abdomen, provided the parietal pleura is irritated. This is notably true in children.

The distinctive feature is general abdominal pain not distinctly localized and most pronounced along the distribution of the tenth, eleventh and twelfth intercostal nerves. The rigidity is not as pronounced as in peritoneal inflammation. The tenderness is superficial, often most pronounced when a fold of skin is picked up between the thumb and finger. After the confidence of the patient is obtained it is noted that deep pressure does not increase the pain as in peritoneal inflammation. This sign is more easily elicited after a hot wet pack has been placed over the abdomen for half an hour. When the diaphragm is irritated there may be pain in the neck transmitted to the third and fourth cervical nerves by way of the phrenic. These pains are aggravated by deep breathing or cough. In pneumonia the leucocyte count is often higher than is ever seen in early peritonitis.

Examination of the lungs early in the course of the disease may disclose only a hyperresonance, often crepitant râles, and in later cases an area of dullness can be made out. The latter must not be depended on unless the disease is of some days duration. In adults an important sign is the rapidity of the respiration and the height of the temperature. In children it must be remembered that the height of the temperature is greater in proportion in peritoneal disease than in adults. The most common cause of error is the failure to examine carefully the chest, particularly the posterior portion. In children fortunately upper abdominal diseases are exceedingly rare and the chief concern is the possible presence of an appendicitis. The presence of bladder disturbance even to retention may be present in appendicitis in children which is not a part of chest diseases. Rectal examination may reveal a resistance near the pelvic border.

It must not be forgotten that thoracic and abdominal disease may coexist. A case in point: An ex-athlete weighing 230 pounds was taken during the night by

excruciating pain located in the mid and right abdomen. Half a grain of morphine secured only partial relief. The onset of the pain was preceded by a chill. His physician found him with a temperature of  $104^{\circ}\text{C}$ . and a respiratory rate of 38, the abdomen distended. When I saw him on the second day his respiratory rate was 40, the temperature  $104.2^{\circ}\text{C}$ . There was distinct dullness in the lower right lobe but without friction rubs. Obviously the patient had pneumonia. The abdomen was distended, with slight rigidity in lower right rectus and some deep tenderness. Obviously the severe abdominal pain would not be dependent on a pneumonia, most certainly not without a coexisting pleuritis. The severe pain and the slight abdominal signs did indicate a gangrenous appendix. Operation revealed a gangrenous appendix approaching necrosis.

When a considerable probability exists that so serious an abdominal lesion as a necrotic appendix, a perforation or an obstruction complicates a pneumonia, exploration should be done, in such cases of course under local anesthesia.

*Cardiac Disease.* Pericarditis and anginas sometimes produce pain of considerable intensity in the epigastrium and even lower in the abdomen. Usually in angina pectoris there is a history of previous attacks. When a portly old man is seized by an intense pain soon after eating a hearty meal one thinks first of pancreatitis. Following exertion one naturally thinks of angina pectoris particularly if there is pain down the left or even the right arm. In angina the patient usually is reclining or sitting in a chair. The patient with pancreatitis lies down. The face of the anginal patient is pale, not ashen as in pancreatitis. The wild eyes, pale sunken features gives credence to the patient's expressed fear of death. In most instances the patient will have recovered from his anginal attack spontaneously before the surgeon arrives. If the patient has received morphine the cause of the amelioration of symptoms may not be perfectly clear.

Ordinarily examination of the heart gives evidence of disturbance but many men of past middle life have cardiac and vascular changes before they have either an anginal attack or an acute pancreatitis. When at all possible the responsibility should be placed on an internist. They pass the buck to the surgeon so often and here is a chance to square accounts.

Sudden decompensation of the heart with distention of the liver has been confused with gall-bladder and appendiceal inflammation. Palpation of the liver and examination of the heart usually clarifies the situation. The symptoms are not severe enough to simulate an abdominal disaster and few would be tempted to operate on a simple appendicitis or gall-bladder colic when there is any doubt as to the condition of the heart. Error here is possible only when the heart is forgotten.

There is even less excuse to confuse a pericarditis with severe abdominal disease. Careful examination of the heart should solve the problem but when the patient is deeply under the influence of morphine the surgeon may have some anxious moments particularly if everything is all set when the surgeon arrives.

*Genitourinary System.* Renal stone and hematogenous infections of the kidney are most apt to simulate serious abdominal diseases. Renal colic in its typical form is fairly characteristic but there are so many variations that a knowledge of the typical picture is of little use in half the cases. Only about half of the cases have the typical pain and tenderness in the kidney region. It may be most noted in the region of the gall bladder, or over the entire abdomen, or in the lower abdomen only, or even on the unaffected side only. Conversely the pain of gall-stone colic may be felt in the kidney region. I once saw a distinguished surgeon cut down on a kidney three times in one week to find gallstones instead of a kidney stone. That was before the days of the roentgen ray and visualization of the gall bladder of course. With all our refinements it is still possible to be wrong



in whole or in part. Blood in the urine is absent in half the kidney stones and is present in many of the disasters within the peritoneal cavity. The error I fear most is the confusion of a gangrenous appendix with a renal colic. A very severe pain which subsides with or without a hypodermic characterizes them both. In both, the abdomen is usually somewhat sensitive to pressure. The roentgen ray may show a stone or a rectal examination may show pelvic peritonitis indicating an appendicitis but a low stone may leave sensitiveness here. After all the evidence is sifted and there is still doubt I am quite willing to remove the appendix and see how it looks.

It may seem ridiculous to mention uremia in this category. I once operated upon a woman brought to the hospital with severe epigastric pain, distention and vomiting. The history indicated a long-standing disorder of the stomach. The urine was reported normal but of light specific gravity. The autopsy showed kidneys not larger than walnuts, the smallest kidneys I have ever seen, and viewed in retrospect they grow smaller still. I mention here, with a feeling of pride, that I have never diagnosed a Dietl's crises. I have studied the kidney and ureter and I am sure it is not possible to so kink the ureter sufficiently to occlude its lumen.

Hematogenous affections of the kidney usually present a stormy beginning. The temperature is usually too high for an intra-abdominal crisis. Deep tenderness in the renal triangle is usually very characteristic. If one remembers that the urine may be normal the first few days, in the kidney infection, error is not likely.

Testicular inflammation when associated with inflammation of the lymph gland at the border of the pelvis may simulate an intra-abdominal inflammation. Therefore the testicle should always be examined. Prostatitis, particularly acute seminal vesiculitis, may cause severe referred pain. Patients with one of these affections may give wholly misleading histories particularly if members of their family are present.

It is rare that diseases in this region are severe enough to simulate abdominal disasters. The patient may complain vociferously enough but he does not look the part.

*Injuries to the Spine.* With rare cases of injury to spine or ribs which involve the spinal nerves may be associated abdominal pain and tympany. Fever, leucocytosis and true muscular rigidity are absent and the tympany arises too early to be due to a peritonitis. When associated with trauma sufficient to produce shock the differentiation from a visceral lesion may be difficult. If the lesion is a pinching one, as being caught between two heavy objects or run over by a heavy vehicle without associated injuries, exploration is advisable if there is an ascending leucocytosis. The exact analysis of the nature of the trauma is of the greatest aid.

*Diseases of the Nervous System.* Tabes not infrequently produces a series of symptoms which suggest severe abdominal disease. Sometimes a history of indefinite pains in the epigastrium associated with pain between the shoulders suggests ulcer. If on this history severe epigastric pains supervene one may be led to think of a perforating ulcer. Careful examination of the nervous system will make the diagnosis clear but this requires talent not always available. Usually a superficial examination will save the error. It is recorded that a tabetic patient may actually have a perforating ulcer. This possibility, however strong, would induce few surgeons to operate on a patient afflicted with tabes.

Lead colic may simulate an abdominal crisis. I once attended a young painter who fell from his ladder writhing with pain in the abdomen. I did not operate on him because the master painter made the diagnosis of lead colic. I recalled he rolled about in his lamentations in a manner not imitated by those who have a perforation and the cold, beaded brow was not in evidence. Examination of the gums and blood should give evidence of lead poisoning.

*Minor Intrapерitoneal Affections.* This

group of affections I shall not consider. It includes gall-stone colics, cholecystitis, inflammation of the appendix and the great group of pelvic diseases. They rarely cause great difficulty in diagnosis and they are not emphatically surgical. There is sufficient time to permit examination. Those cases which simulate grave diseases will be considered in connection with the differential diagnosis of the major diseases.

#### MAJOR INTRA-ABDOMINAL DISEASES

*Perforative Diseases.* As above indicated these will be considered in two groups, the perforative and the thrombotic. It is important, let it be emphasized, that these be separated because on this depends proper planning of the operation. In perforation it is highly important that the incision be placed over the point of perforation. To place it elsewhere is very apt to be a fatal error. In the thrombotic type exact localization is frequently impossible nor is it important for we are not dealing with an infection and the wide exposure of the peritoneal cavity is not attended by any considerable additional danger.

*Perforations of the Stomach and Duodenum.* In every language the superlative adjectives have been commandeered to express the intensity of pain associated with perforation in this region. The French apply the word "diabolical." Considered in its historical sense it is about as expressive as any. The words "awful, terrible, unbearable," assume a new meaning when pronounced by patients in the throes of an acute perforation. In a typical case the patient is suddenly seized with intense pain in the epigastrium. The pain at first comes in paroxysms. In the periods of lesser pain the patient lies panting with a look of anxious apprehension on his countenance. "There comes another!" he cries as he writhes in renewed agony. In some cases the patient falls as if shot. The face becomes blanched, the eyes wide, the pupils dilated, and the beads of cold perspiration on the brow aid in depicting the look of terror on his countenance. The pulse

is rapid and threadlike, the abdomen is flat and boardlike but not tender to the touch, though the patient wards off the examining fingers fearful that any manipulations will increase his sufferings.

I once opened an abdomen under local anesthesia in this acute stage. An opening in the duodenum came promptly into the operative field as soon as the peritoneum was incised. With the onset of the pain a jet of cloudy fluid spurted from the opening, and the surrounding intestinal coils and the stomach contracted to the most extreme degree. With the temporary relaxation of the spasm the pain partly subsided. Suturing the hole and the covering of it with omentum did not increase the pain.

The signs of inflammation in this early stage are absent. The initial pain would seem therefore to be primarily a spasmodic one, the spasm being induced by the irritation of the peritoneum by the irritating fluid escaping through the perforation. When not operated on in this early stage the fluid continues to escape and trickles down the water-shed of the great omentum and colon, producing irritation of the peritoneum as it goes. Commonly some of the fluid reaches the pelvis.

After some hours the symptoms of peritonitis dominate the field. Rise of temperature begins, distention and muscular rigidity appear, and if the escaped fluid reaches the pelvis signs of irritation of this region may be marked. The appearance now is that of a peritonitis, and when the patient is first seen at this time the problem is to determine the cause of the peritonitis. This can be determined only by the proper evaluation of the early symptoms.

History should make the diagnosis easy. There are two difficulties that may be encountered. Not all cases begin in this acute manner. Stomach perforations particularly may be partly protected by adhesions, making the onset less dramatic. The physician may promptly administer a hypodermic of morphine, and as the right abdominal pain advances he diagnoses appendicitis, and the history given the

surgeon concerning the epigastric pain may be minimized to fit the epigastric pain generally believed characteristic of beginning appendicitis. In such cases it is necessary to break through the professional barrier, and hear the patient's or a friend's account of the first symptoms.

Examination shows muscular rigidity extending from the epigastrium to the pelvis involving the whole right half of the abdomen, and if the pelvis is reached by the exudate, the lower part of the left rectus as well may be rigid, thus mimicking a primary pelvic disease. An acutely inflamed appendix lying lateral to the colon and approaching the liver may give rigidity of the whole right side of the abdomen but the general course is not as stormy as in an acute perforation. It may closely simulate a slow leak.

Intermittent perforation may present a confusing picture. Not infrequently the impending perforation may be so protected by adhesions so that only a small amount of fluid escapes. The initial pain in such cases may be that of a local inflammation only, a perigastritis which it is in fact. The small amount of fluid escaping may find its way to the pelvis and there set up an inflammation which may appear to be the major lesion. I once mistook such a condition for an ovarian cyst with a twisted pedicle, so big and round was the inflammatory conglomerate produced. More commonly the inflammation simulates an appendicitis. When operating in such a case the surgeon must know whether or not the local changes found in and about the appendix explains the symptomatology produced. In my pathology days I did several autopsies after the surgeon had removed the appendix never suspecting the presence of a perforation higher up.

The perforation may be so walled off as to prevent all but a local abscess. The large amount of inflammatory exudate may so deform the stomach that a malignancy is diagnosed. The process may be so slow that neither a rise of temperature

nor a leucocytosis may be detected even after the process has continued for some weeks. In such a case it is not a perforation thanks to the protective action of the surrounding peritoneum.

*Diagnosis with the Abdomen Open.* When an abdomen is incised through the right rectus the pyloric region is exposed. Usually an exudate is at once encountered, and usually the site of perforation comes readily into view. In the very rare perforations posteriorly the lesser peritoneal cavity is the recipient of the stomach contents. If this is the case one must consider a pancreatitis. An examination of the omentum will show the absence of fat necrosis, and there is no evidence of hemorrhagic infiltration of the pancreas. Sometimes when the fluid does not appear at once in the region of the pylorus an examination of Morris' pouch and the water-shed of the great omentum may show the exudate. This is particularly true when an ulcer has slowly perforated and has become closed by secondary adhesions. Should the operator have made the error of assuming an appendicitis existed, the exposure of the appendix will show an organ in which there is insufficient reaction to account for the severity of the symptoms. Only a gangrenous appendix can produce the acute pain that can compare with a perforation of an ulcer. Often the exudate so irritates colon and appendix that they are reddened and increased in thickness. Such an appendix does not produce pain that can simulate an acute perforation.

*Perforation of the Gall Bladder.* The differentiation between a gall-bladder colic and the beginning of a perforation may not be so easy. Usually the perforation comes on after a cholecystitis has existed for a number of days. If the site of impending perforation is partly walled off before the actual perforation begins, the process may be gradual, and it is only the extension of the pain downward along the colon that indicates a perforation. It was my opinion until recently that when the

inflammation extends as far as the pelvis a perforation has most surely taken place. But it is not so. The inflammatory exudate, non-infective from an intact but thrombotic gall bladder, may reach the cul-de-sac without there being a perforation present. How then shall we differentiate? I do not know. This is one of the conditions in which the fates design to down the surgeon, and he is helpless and must proceed with an uncertain diagnosis. When there is a sudden pain or a marked exacerbation of the pain in the hepatic region, and there is evidence of an inflammation extending downward to the pelvis, the surgeon had best proceed to operation.

When a necrotic gall bladder gives way there is usually a surcease from the colicky pains for some hours and the patient feels relieved until a generalized peritonitis begins. When the wall suddenly gives way with a rapid extension of peritonitis it may or may not be accompanied by evidence of shock. Such a sudden perforation of the gall bladder is more rare. In such instances I see no way in which a differentiation can be made from a duodenal perforation. A case in point is that of a man who had a perforation while in my hospital visiting a brother who had had a cholecystectomy performed a few days before. As he was leaving the hospital he dropped on the steps because of an excruciating pain in the right upper abdomen. An unqualified diagnosis of a perforation of a hollow viscus was made and the duodenum was suspected. He was taken at once to the operating room and a right rectus incision made. A hole near the fundus of the gall bladder was found from which purulent bile and stones had already escaped. There was no inflammation, not even a hyperemia. The irritation of the escaping contents must have been the cause of the extreme pain, since inflammation had not yet begun. In this case gangrene of the gall bladder had not taken place. The accumulated gall-bladder contents had burst the friable necrotic wall.

*Diagnosis with the Abdomen Open.* Usually the presence of bile or a greenish purulent fluid appears as soon as the abdomen is opened. Sometimes when the perforation takes place through one or more openings and the exudate is cloudy one may think first of a duodenal perforation. However in such cases the gall bladder is thickened and there are usually new or old adhesions to the gall bladder. A careful inspection at the point of attachment of these adhesions will show the small openings through which the gall-bladder contents are escaping. It is a good rule whenever there is any doubt as to the cause of an abdominal crisis to look for fat necrosis for not infrequently pancreatic disease follows or is associated with pronounced gall-bladder disease.

*Appendicitis.* I wish to include in this category only the gangrenous and perforative type. The average case of acute appendicitis cannot be regarded as an abdominal emergency.

My memory goes back to the days when operation was not the rule and the mortality was not great. Appendectomy is generally regarded as the proper field for the beginner. This is true for the mythical chronic type. The operation for acute appendicitis in my judgment taxes the resources of the surgeon more than any other common lesion within the abdomen; and unless a skilled surgeon is at hand the patient is better off under the protecting wing of his family doctor.

Gangrenous appendicitis is another matter. Here unless relieved by operation the patient will surely die. This type of disease is characterized by sudden very severe abdominal pain generally diffuse at the beginning. Let it be repeated that the one important diagnostic point is the very severe pain at the outset of the disease. After a period the pain subsides and there is but little reaction in the region of the appendix. The temperature may be but little elevated, and the pulse but little increased in rate. There is usually slight discomfort in the appendiceal region but

no actual inflammatory reaction. The reason for the subsidence of the symptoms is that owing to the occlusion of the appendiceal artery the whole appendix dies, and dead tissues transmit no pain. It is not until the necrotic tissue separates and the contents escape that generalized peritonitis begins. The dead appendix does not excite the surrounding peritoneum to preparatory reaction, and the intestine contents is poured into the unprotected peritoneal cavity. Hence the almost universally fatal results.

In the beginning this type of appendicitis really belongs to the thrombotic type, but because perforation will sooner or later occur it is included here. Because of the death of tissue this type closely resembles intestinal obstruction or mesenteric thrombosis in its early manifestations. The subsidence of the pain after ten or twelve hours, the absence of tympany, and certain limited local reaction, suggests a gangrenous appendix.

*Diagnosis with the Abdomen Open.* When the incision reaches the preperitoneal tissue there may be some edema. If this is most pronounced in the lower end of the wound the diagnosis is all but confirmed. If, however, the reverse is true, one thinks at once of the possibility that the irritation is coming from a perforation above. After the abdomen is opened the fluid will be bloody in most instances, which at once excludes perforation of the stomach or gall bladder. The appendix is sought and will be found to be big and black. If the appendix is not the seat of gangrene the bloody fluid spells intestinal obstruction, mesenteric thrombosis or some other disease disturbance of the circulation, and the surgeon must at once search toward the midian line. If on the other hand the exudate is flocculent, milky or contains food particles the incision must at once be extended upward.

*Perforation of Typhoid Ulcers.* In the course of a typhoid fever if there is sudden pain, particularly to the right and below the umbilicus, perforation must be sus-

pected. If the leucocyte count before the advent of pain is known and shows a slight rise, particularly in the number of the polymorphonuclears, the probability of a perforation is established. Local tenderness likewise adds additional evidence. The condition of the patient may be such that the primary pain is not noted, and local tenderness and increased tympany may be the first evidence of perforation. Operation on suspicion is justified. Fortunately these patients lend themselves particularly well to exploration under local anesthesia. This makes the operation practically innocuous, and the surgeon need not hesitate to proceed.

*Diagnosis with the Abdomen Open.* A low right rectus incision best brings one to the seat of trouble. If an incision 4 or 5 inches long is made, after a thorough anesthetization with novocaine, one can lift up the abdominal wall and view a considerable area of intestines without manipulating them. Usually there is some attempt at adhesion, which guides one to the area of trouble. If not, one needs but explore the terminal yard of small intestine to find the seat of perforation.

*Perforating Malignancies.* Sudden pain with signs of inflammation is in evidence. To associate it with malignancy is dependent on the ability to diagnose a pre-existent malignancy. Progressive loss of weight antedating the beginning of the pain, and the general appearance of the patient are the chief guiding signs. Carcinomas of the stomach and of the sigmoid are the most apt to perforate, and initial pain in these regions may furnish the first suggestion as to the nature of the trouble.

*Diagnosis with the Abdomen Open.* An area of infection is encountered, and with it a thickened intestine. The question to be decided is whether the thickening is due to a neoplasm or to an inflammation. This condition is usually found about the sigmoid. Then it is a question of diverticulitis or carcinoma. In carcinoma there is thickening of the gut above a constriction or a tumor.

*Perforation of Pelvic Tumors.* A hemorrhagic myoma bursting through its capsule, or a rupture of the walls of a pseudomucinous cyst produces sudden pain and shock. Usually a bimanual examination reveals a pelvic tumor and the added symptoms disclose a rupture or a twisted pedicle.

*Diagnosis with the Abdomen Open.* In a bursted myoma bloody fluid together with a myoma will be found. If a cyst has bursted, the intestines will be found floating in a mass of pseudomucin. A tumor with a twisted pedicle will appear as a blue-black tumor often surrounded by a hemorrhagic exudate.

#### THROMBOTIC DISEASES

In the preceding group of diseases the fundamental factor was the escape of the fluid contents of an organ into the unprotected peritoneal cavity through an artificial opening. It is a problem of inflammation of the peritoneum. In the group now to be considered the fundamental factor is the death of tissue. Inflammation enters the problem late if at all. Therefore the evidence in these is to be found in pain and general tenderness characteristic of the peritonitis following perforation. In all of this group there is disturbance in the circulation and the extravasation of blood. This hypothesis rests on the fact that this is the only constant factor in these diseases. It simulates conditions in which thrombosis and extravasation of blood, particularly the latter, are present. In lesions within the abdomen in which thrombosis and extravasation do not take place the symptomatology characterizing this group is absent.

*Intestinal Obstruction.* The primary symptom in acute intestinal obstruction is to be found in the injury of the intestine wall, and only secondarily to the interference with the fecal circulation. This fact is often demonstrated clinically, for instance in intestinal obstruction by a foreign body just large enough to occlude the lumen. There are intermittent cramping pains but no vomiting and no constitutional reaction. I have observed this in a number of in-

stances in obstruction from gallstones and once by a conglomerate of paw-paw seeds. This can be confirmed by animal experimentation. When an intestine is simply compressed sufficient to occlude the lumen by means of a lead plate, no symptoms follow immediately. Later on, peristalsis becomes more active, as one can readily observe under the fluoroscope. Following this come distention and evident discomfort. If, on the other hand, the plates are made to compress the intestine sufficiently to occlude the circulation, increased peristalsis and evidence of discomfort begin at once.

The clinical picture of an acute intestinal obstruction due to injury to the intestine, as by twisting, or pinching, is that of a sudden severe pain accompanied by general constitutional disturbance. The pain is spasmodic in character, and there is evidence of increased peristalsis. This peristalsis is the effort of the bowel to free itself from its predicament, and not due to the disturbance of the fecal circulation. This is seen clinically when but a part of the wall is pinched, as in a Richter's hernia. The bowel is not occluded at all but there is just as much disturbance in the abdomen as if there were a complete occlusion. The vomiting is reflex, and occurs whether or not there is anything in the stomach. The vomiting of obstruction on the other hand is due to the regurgitation of the intestine contents as one can readily see and smell. The violence of the pain is in general proportional to the degree and extent of intestine involved.

Therefore while the initial pain in perforation and obstruction may be alike and both accompanied by increased peristalsis and vomiting, the perforation is followed at once by evidence of peritoneal inflammation. Intestinal obstruction on the contrary is attended by increasing distention but not by muscular rigidity as in inflammation. True enough if the injured intestine can come in contact with the parietal peritoneum there will be a reaction to the circulation in the parietal peritoneum and



an associated tenderness but it lacks the muscular rigidity of peritonitis. Furthermore perforation usually takes place in certain areas as above enumerated. In intestinal obstruction, on the other hand, unless some antecedent condition as old scars or tumor is present to form a clue, one has no definite guide as to the location of the trouble. The statement that early vomiting indicates an obstruction high up, while late vomiting indicates a low lesion, is seldom of real use in a concrete case. More often it is an indicator of tissue injury rather than of location.

After a time both temperature and pulse may become elevated. Blood count and temperature is that of blood extravasation, about 12,000 white blood cells with a temperature of less than 102°C. This, it will be noted, is about the disturbance one sees in tubal abortions, ruptures of viscera, and in general following extensive operations. The pulse rate, too, is generally low, but may be high if there is sufficient disturbance to produce shock. When these signs begin one may be sure that the intestine wall is suffering injury from the obstructing agent. Small or large vessels are thrombosed and there is extravasation.

That the pain is due to the injured tissue and not to the distention is indicated by the fact that when the intestine dies at the point of obstruction the pain ceases and the patient is free from pain though the patient is still distended and vomits incessantly. This cessation of pain with the advent of necrosis often leads the patient to believe he is improving. Once in consultation in such a condition in reply to the statement of the physician that the patient was better, my assistant, the late Dr. Wuttke, gave vent to the following axiom, "A patient with obstruction who feels better without passing from his bowels is worse: gangrene has begun."

I want particularly to emphasize the importance of the anatomic changes in the gut wall because in the present intensive studies in physical chemistry investigators are prone to forget that obvious

changes are taking place in the intestine wall. This is particularly important to the operating surgeon, who with tissue in hand reads in large measure the past and future of his patient.

*Diagnosis with the Abdomen Open.* In intestinal obstruction unless there is some evidence to warrant a presumptive topographic diagnosis it is best to make a mid-line incision. Usually distended intestines protrude as the incision is made. If serous exudate greets the operator he may be hopeful that gangrene has not developed. If bloody fluid escapes he must expect to find dead intestine. In the first event he may look for a constricting band or an early twist. Usually if the distended intestine is followed the point of constriction will be found, or conversely, if collapsed intestine is followed until it meets the distended intestine the lesion will be found. This alone is not sufficient. A definite organic constriction must be found. Sometimes a part of the intestine is collapsed and a part distended without there being any constriction at all. If there is a bloody exudate necrotic intestine must be found or else the entire length searched. If no definite constriction is found other lesions must be looked for. In distention from other causes it is not unusual to find a part of the intestine distended and a part collapsed without there being any constriction. The inexperienced operator is very apt to diagnose it as volvulus. Unless there is evidence of local circulatory disturbance a volvulus cannot be diagnosed. This most assuredly is true if there is constitutional disturbance. Failing to find evidence of constriction, other causes capable of producing the symptoms presented must be sought. Fat necrosis particularly must be sought. I have seen repeatedly at autopsy cases in which a volvulus had been diagnosed and the real lesion overlooked. The most common error was an unrecognized pancreatitis. The next most common was some heart lesion. Unfortunately pathologists commonly are employed on a salary and they



are not always in a position to tell all they know.

**Acute Pancreatitis.** Hemorrhage into the pancreas begins with excruciating pain in the epigastrium. It may extend straight through to the back and may even be felt most intensely there. There is collapse, vomiting, and extremely rapid pulse. There is early abdominal distention without notable local tenderness. The features early become sunken and the complexion ashy.

The subjects are usually well fed males of middle life or beyond, and the attack comes most often after a full meal has been eaten. Not uncommonly acute pancreatitis attacks patients known to be suffering from gallstones. The question then arises whether or not the attack is one of gallstones. Milder degrees of pancreatic disease may precede the serious attack. If these have been diagnosed as gall-bladder attack one is apt to think first of the gall bladder, particularly of a ruptured one. Usually a glance at the patient convinces one that the attack is too acute and too severe to be from gall-bladder spasm but the differentiation from pancreatitis and perforation of the gall bladder may be quite impossible. The pain in ruptured gall bladder is in the hepatic triangle, that of pancreatitis to the back is exactly in the center of the back. Intestinal obstruction often is diagnosed. The collapse, very rapid pulse, the location of pain and the color is simulated by obstruction due to volvulus. Mesenteric obstruction due to volvulus simulates pancreatitis in suddenness of onset, but there are no back pains and the ashen color is lacking and the patient younger. Distention "after a banquet usually are victims of acute pancreatitis or coronary sclerosis.

**Diagnosis with the Abdomen Open.** When pancreatitis is diagnosed one looks first for bloody exudate, then fat necrosis in the great omentum or mesentery. Fat

necrosis is one of the most characteristic lesions found in the abdomen and is the one most commonly overlooked or looked at and not seen. The whitish gray spots set in the yellow fat of the omentum or mesentery is as if a hole had been punched out and filled with caseous material (Fig. 4). Not finding either or both, the pancreas is palpated. If found normal, the gall bladder is examined. If found negative, search must be made for intestinal obstruction. If this is negative, the region of the appendix is approached, and if a lesion is found here a new incision must be made. The surgeon must not allow humiliation to overtake him if he misses a diagnosis of pancreatitis. Conversely, when operating for other acute abdominal lesions fat necrosis should always be sought for if there is any question as to the cause of the symptoms.

**Thrombosis and Embolism of the Mesenteric Vessels.** Any condition which occludes a mesenteric vessel of any magnitude produces a disturbance of the blood supply of the intestine wall resulting in anemic necrosis or hemorrhagic infarction. Hence the symptomatology is similar to that in intestinal obstruction, though the lumen of the intestine is not narrowed.

Pain is nearly always the introductory symptom. It is sudden in onset, diffuse in distribution, constant and dull in character, but there may be colicky exacerbations in the beginning. In some cases the pain is gradual in onset, particularly in those cases which are superimposed on some previous infection. One can make an hypothesis in such cases of the gradual occlusion of the vessel by a thrombotic mass with a good deal of confidence. Local symptoms follow when the parietal peritoneum becomes irritated by the distressed intestine.

Vomiting is common, and when the vomitus contains blood it has diagnostic significance. Diarrhea is present in the majority of cases, generally bloody in character, and when taken in conjunction

with the initial symptoms above detailed warrants a presumptive diagnosis. This sign is particularly valuable in superimposed cases, say coming on some days after operation for acute suppurating appendicitis. The initial symptoms are apt to be ascribed to acute intestinal obstruction associated with the operation and the drainage introduced. Bloody vomiting or bloody stool turns the attention to the mesentery. Distention and tenderness are associated in variable degrees but bear nothing distinctive.

Stress is placed sometimes in the search for a primary focus for an embolic process. In none of my cases has there been a cardiac lesion.

*Diagnosis with the Abdomen Open.* A bloody exudate is almost sure to greet the operator. The affected intestine when found may feel like a garden hose, so firm are the walls. When seen within a few hours after the onset this thickening of the intestinal walls may be absent and the blue intestinal walls the only thing distinctive. Sometimes this is so little marked as not to be noticed. The mesenteric vessels must be examined and can usually be demonstrated as being thrombotic.

*Torsion of the Omentum.* The majority of cases of torsion of the omentum are associated with large inguinal hernias. When a patient so encumbered has gradually increasing pain and swelling in his hernial sack with increased resistance in the lower abdomen extending upward from the inguinal region, the diagnosis is fairly easy. However the onset may be sudden. One of my patients dropped while walking along the street and had to be transported to the hospital by a passer-by. Another who long had an irreducible inguinal hernia was seized with severe pain as he stepped from a ladder in his dry-goods store. The differentiation between torsion of the omentum and strangulated irreducible omental hernia is dependent on the fact that in strangulated hernia the induration of the abdominal wall does not extend much

above Poupart's ligament, while in torsion of the omentum it extends up as high as the umbilicus.

In a minority of cases the twist in the omentum occurs in the absence of a hernia. The pain is as severe as in the preceding affections. In such cases the only guiding evidence is found in the fact that corpulent individuals are most commonly affected. In my single case the back pains and rapid pulse of pancreatitis were absent but I diagnosed pancreatitis just the same. The general symptoms are severe pain widely distributed not to be distinguished from intestinal obstruction or mesenteric thrombosis.

*Diagnosis with the Abdomen Open.* Unless the patient is exceedingly corpulent a mass can be felt once the patient is anesthetized. Bloody fluid is always present. A hard black tumor is readily made out, which when delivered can readily be made out as belonging to the omentum. When a hernia is present the exploration of the sack shows the omentum to be black, and when delivered shows torsion to be the cause of the necrosis. Sometimes a hemorrhage into a myoma, to which the omentum had previously become attached, the huge omental vessels may suggest a torsion but by following the omentum downward the differentiation becomes easy. Besides the surgeon should know of the presence of the myoma which should suggest the correct diagnosis.

*Summary.* Nowhere in medicine is a working knowledge of the pathology of the living so vital as to the surgeon when confronted by the major lesions within the peritoneal cavity. Clinical diagnosis is never certain and the surgeon must be able to orientate himself quickly and certainly after the abdomen is open. Error at this point is far more disastrous than a wrong diagnosis before the operation. It is of vital importance to differentiate between an infection and one in which infection does not play a part. Thus orientated the skilled surgeon can correct minor errors

in diagnosis without detriment to the patient.

#### CONCLUSIONS

1. Abdominal crisis must be distinguished from extra-abdominal affections and milder intraperitoneal affections.
2. An effort should be made to distin-

guish between perforations of hollow viscera and conditions attended by disturbances in the circulation.

3. The best clinical observation possible must be supplemented by observations made after the abdomen is open lest a minor lesion be mistaken for the major lesion.



#### [SURGICAL SUGGESTIONS]

THE chronic bone abscess is an exquisite example of longevity of organisms in the tissues, of the attenuation of bacterial virulence and of the long latency of low grades of bone infection.

THE chronic bone abscess is often, if not usually, residual from an osteomyelitis active even twenty or more years before the abscess makes its presence known. Sometimes, however, it occurs as a solitary process, metastatic or even without any discovered antecedent infection.

CONTRARY to teaching still to be found in textbooks chronic bone abscesses are not usually but rarely tuberculous and are found not only in the ends of the shafts. They occur at any level in the length of the bone and in any layer of the bone-cortical, cancellar or medullary.

ABSCESSSES within the compact or cancellous substance of the bone show clearly in the roentgenogram. The bone surrounding the abscess is usually of greatly increased density, but sometimes the cavity is in bone of normal or nearly normal density.

# A STUDY OF GOITER CLASSIFICATION AND NOMENCLATURE\*

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IN our present uncertainty regarding the etiology of goiter and the relation between its symptomatology and thyroid pathology, it seems logical to argue that the nomenclature and classification should be as simple as possible. The need for one simple classification is better understood when it is recalled that there are more than twenty classifications in use among the one hundred and forty men to whom letters were sent. No two classifications closely resembled each other and no two men, so far as could be learned, were using the same classification. No criticism is implied for any of these classifications but their multiplicity speaks for itself.

Having these things in mind I selected from the literature a simple classification into the terms of which the more complex classifications can be easily translated. This was sent to the heads of the departments of medicine and surgery of the medical schools of the United States and Canada with a letter which read as follows:

"Because of the large number of terms and the diversity of classifications offered, I am making inquiry from the leaders in medicine and surgery in this country and Canada regarding the classification which they use in their daily work.

"I am quoting below a very simple classification.

- I. Diffuse Colloid
- II. Adenoma
  - (a) without hyperthyroidism
  - (b) with hyperthyroidism
- III. Exophthalmic
- IV. Tuberculosis, syphilis, thyroiditis, malignancy.

"In your opinion would this classification be of value to the general practitioner who

sees goiter and devotes his attention to it only as part of his day's work and not as a thing to which he devotes special attention or with which he is especially familiar?"

No claim is made that this is the best classification to be found or indeed that it is superior in any way to others appearing in the literature. If every doctor on the continent understood it the profession would speak one language regarding goiter, which would be a decided advantage over the present Babel-like confusion.

One hundred and forty letters were sent out. Sixty-seven answers were received. Of these fifty-two felt that this classification might well be adopted by the rank and file of the profession. Six were definitely opposed to it and nine said nothing about it but merely indicated the classification they were using in their own work.

The terms in this classification refer to gross pathology determined by the palpating hand before operation. The diffuse colloid goiter refers to a smooth uniform enlargement involving the entire gland, no nodules being visible or palpable. The gland has a smooth globular feel and only occasionally are there slight or fleeting signs of hyperthyroidism.

The adenoma refers to a gland containing one or more nodules either visible or palpable. Or the enlargement may involve only part of the gland. There are times when nodules are situated deeply in the colloid goiter and their presence cannot be demonstrated until the gland is considerably reduced in size.

The adenoma with or without hyperthyroidism refers, of course, to the functional activity of the thyroid. The tendency

\* Read at the annual meeting of the American Association for the Study of Goiter. Philadelphia, February 1, 1927.

## Hutton—Goiter Classification

of all adenomatous goiters is to become toxic; this tendency increasing greatly after the twenty-fifth year.

In December and January last I sent to the same men to whom the classification had been sent a questionnaire regarding the use of iodine in the treatment of goiter. Accompanying the questionnaire was the following letter:

"It is realized that this discussion of iodine and goiter covers the field but superficially. If the rank and file of the profession were acquainted with the few facts enumerated here it is believed they would be in a better position than at present.

"Many men feel that the use of iodine is good treatment for some forms of goiter. Being uncertain as to the varieties in which it is useful they give it to all goiter patients, not only as a preoperative measure but for indefinite periods of time. In these cases it loses its value as a pre-operative measure so that the patient's chances of recovery are minimized.

"Goiter is a very live subject in our society because of the large number of goiters in Illinois, more particularly in that section of the state lying in the Great Lakes basin. A questionnaire is being sent to the foremost teachers in the United States and Canada in the hope that we may discover a few facts on which the leaders of the profession are agreed which we can pass on to our county societies. For your convenience a 'yes' and 'no' is arranged after each question. If you have the time to go into these questions in greater detail we shall appreciate your attention."

Sixty men replied to the letter. Twenty-three states and three Canadian provinces were represented in the answers. One man felt that too much information was asked for and so answered none of the questions. One man did not handle goiter cases and consequently felt himself incompetent to answer. Two men did not believe their experience was sufficiently broad to permit them to answer.

This leaves fifty-six men who returned answers which are tabulated as follows:

Question No. 1. Do you believe that iodine should not be used as a public health measure in the water supply or table salt?

Forty-five men indicated that they were opposed to the use of iodine as a public health measure in the water supply or table salt of a community. Nine felt that it might be used in some cases and under certain circumstances. Two men who replied to the questionnaire failed to answer this question. Of the nine who believed it might be used one man felt that the use of iodine in the water supply should depend on the definite showing of iodine deficiency in that locality. the sanction of the State Medical Society, if it were a state-wide question, and of the County Society, if it were a county question.

Question No. 2. Do you believe that public health agencies should restrict their efforts in the goiter field to educational propaganda?

Forty-six men felt that public health agencies should restrict their efforts to educational propaganda. Three were distinctly opposed to this idea. Six felt that there might be certain exceptions.

Question No. 3. That they should explain to the laity that goiter is many times a preventable disease or condition: that many cases can be easily cured if properly treated early?

Fifty-three felt that this information should be disseminated to the laity. Two qualified their answer but agreed in the main with this idea.

Question No. 4. That treatment should be left to the private physician who has opportunity to make a more careful and detailed examination than can or should be made by public health authorities?

Forty-nine felt that treatment should be left to the private physician. Six favored this but felt that there might be occasions when public health agencies might enter the field. Two were opposed to this idea in part.

Question No. 5. For the guidance of the average doctor who sees only an occasional goiter case as part of his day's work, do you believe it would be wise to disseminate the idea that iodine is good treatment only for the diffuse colloid goiter?

Thirty-four felt that it would be wise to disseminate the idea that iodine is good in the treatment of only one variety of goiter—the diffuse colloid. Six agreed with the idea in part. Ten were definitely opposed to it. Four were dubious as to the wisdom of it. One omitted answer.

This question was intended to convey the idea that the field of iodine, as a curative measure in the treatment of goiter, is limited to the diffuse colloid variety and that all other should not be subjected to it, except as a pre-operative measure, as indicated by the succeeding questions.

A leader from the Pacific coast voted "yes" and in a letter amplified his answer by the statement, "In the goiter clinic where we have patients under observation for a long period of time, we have entirely discontinued the use of iodine in the treatment of colloid goiter because of its inefficiency. We are using dessicated thyroid for the purpose of putting the thyroid gland at rest. Then after it is reduced in size we give the ordinary preventive iodine. We have observed patients with small colloid goiter treated with both dessicated thyroid and iodine over periods of time, varying from six months to two years. Dessicated thyroid was uniformly efficient while iodine usually was not. Care must be taken in making a diagnosis between early hyperplasia both of the cellular and acinar (adenomatous) types as these do not yield to treatment."

This coincides with the writer's feeling on this subject. But if there be a field for the use of iodine as a treatment it must be in the variety under discussion.

Question No. 6. That the adenoma without hyperthyroidism should never be given iodine because of the great danger of converting it into an adenoma with

hyperthyroidism (though an occasional case may improve on it and a few may not be made worse by it)?

Forty-eight were of the opinion that iodine should not be given to the adenoma without hyperthyroidism. Two were undecided on this point. One omitted an answer.

Four qualified their answers as follows:

"No, I don't view adenoma other than localized overgrowth. The etiological factor is the same."

"Absolutely yes."

"No, not possible."

"No, I'd leave it to the judgment and experience of the doctor with reservations in the case of physicians competent to assess the risk, etc."

Question No. 7. That iodine should never be given to the adenoma with hyperthyroidism except when the patient is in the hospital and then only for five to twenty days as a pre-operative measure?

Forty-six men felt that iodine should be used only as a preoperative measure. Three were uncertain on this point. Four were of the opinion that it was never indicated in this variety of goiter. One man who does a great deal of goiter surgery in the middle west wrote, "And the wise surgeon will rarely use it then." One man stated that he had given it to hundreds of cases of this type but had never come to any conclusion regarding its effect in this group of cases. Another said, "I doubt the use of iodine in this type of case even as a pre-operative measure."

"Question No. 8. That an adenomatous or asymmetrically enlarged thyroid with hyperthyroidism is always a surgical condition?

Forty believed this to be a surgical condition. Six were unqualifiedly opposed to the idea that this is always a surgical condition. Three of these were surgeons. One felt that an absolute "yes" or "no" was not possible. One said "yes and no; there may be many other factors to decide." Two said "yes, usually." One surgeon said "yes" to the adenomatous thyroid and "no" to the asymmetrically enlarged thy-

roid. Another felt the last six questions should be individualized and the patients seen by a specialist. Another felt that roentgen ray sometimes cured these cases. Three did not answer this question.

"Question No. 9. That an adenomatous or asymmetrically enlarged thyroid with hyperthyroidism is one of the most confusing goiters with which the practitioner is confronted because it is so frequently confused with heart disease, nephritis, high blood pressure, and "nervous breakdown," the presence of a small goiter being frequently overlooked entirely or its relation to the major syndrome being misinterpreted?

Fifty-four agreed unqualifiedly with the opinion expressed in the question. One was uncertain and one omitted the answer. This question was intended to direct attention to the thyroid in the conditions mentioned. The writer feels very sure that in these cases the presence of a small goiter is frequently overlooked or its relation to the major syndrome misinterpreted.

Question No. 10. That iodine is of value in exophthalmic goiter only as a pre-operative measure and only on one occasion. That is, while it will cause a remission of symptoms once it will rarely do so the second time, so that its use should be restricted to the pre-operative period of five to fifteen days?

Forty agreed unqualifiedly. Six agreed with reservations. Five disagreed with the idea expressed in the question. Three disagreed with some qualifications. Two were undecided.

In order to more clearly orient some of the answers and to present more accurately the viewpoint of some of the men, a few letters that accompanied the questionnaire are quoted. One man wrote:

"Of course questionnaires are very unsatisfactory. You have worded these questions allowing a more satisfactory answer by 'yes' and 'no' than is usually the case, and yet the problem is so complicated that even these questions are hard to answer. "Personally, we try out iodine for one

week in every kind of goiter with symptoms unless accompanied by evidence of myxedema, in which case, of course, we use the thyroid gland itself, and at the end of a week by the patient's feelings, pulse, etc. make up our mind whether or not to continue; but we use only 3 mm. of Lugol's twice a day and so avoid the danger of the rather large doses."

Another said:

"Enclosed you will please find my replies to your questionnaire. Amplifying those replies I should like to say in answer to question No. 1 that I do not believe municipal or state authorities should be allowed to treat a public water supply until exhaustive chemical analysis has shown conclusively a deficiency of iodine content and further safe-guarded by approval of the State Medical Association in municipalities.

"In answer to question No. 5. We must realize that the 'average doctor' is a doubtful authority as to the diagnosis of 'diffused colloid goiter,' by which I understand you to mean adolescent goiter. Adenomas are sufficiently frequent in children of this age to make one look askance at a general advice of this nature.

"In answer to question No. 7. I have stated that I do not believe that iodine is indicated in a toxic adenoma, whether in or out of the hospital and without regard to the number of days preceding operative procedures. It is my opinion that iodine is absolutely contraindicated in all toxic adenomas except perhaps in the rather unusual combination with exophthalmic goiter.

"Question No. 8 raises the question of making all toxic adenomatous thyroids subject to surgical intervention. In the majority I believe that surgery is the more preferable method of treatment for these conditions, but it cannot be made an infallible rule. The degree of toxicity, the age of the patient, the presence of other conditions, which make surgery undesirable, may put a small per cent of these cases into a group where galvanism, roentgen-ray



exposures or rest with ice bag may be indicated. It has been my experience that nearly all toxic adenomas which I have seen treated by these measures will, though they improve for a time, present subsequent evidence of toxicity."

Another man says:

"The problem of the use of iodine in these cases is subject to a considerable amount of debate and is more important to you where goiter is endemic in your locality than with us where it is only occasional. Nevertheless, I have seen much harm arise from its injudicious use and it seems almost impossible to convince some members of the profession that damage can arise from its use."

Another one:

"No doubt the public health agencies should restrict their efforts to educating propaganda rather than the advising the use of iodine in various forms. This no doubt has done a great deal of harm. Furthermore, the benefit to be derived from the use of iodine when hyperthyroidism is present is somewhat questionable. Its use should certainly be restricted to a limited period and then under strict supervision preparatory to the operation."

The Dean of one school wrote, "I have wished to see that the opinion which I expressed was in fact the joint opinion of my colleagues here. The only question which I felt unable to answer "yes" or "no" is question No. 4 which I have marked with a circle, somewhat extending my opinion at the bottom of the page. Otherwise to me the questions are more or

less clearly stated and should, I think, receive wide assent."

This school is in a goiter zone. The extended opinion reads, "I think the school physicians are now in a position to deal with goiter in children more effectively than are private physicians. I, therefore, raise the question as to whether this should not be regarded as an exception under this heading."

#### CONCLUSIONS

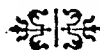
In the main it is agreed that iodine should not be used as a public health measure in the water supply or in table salt. Public health agencies should limit their activities to educational work.

Treatment should be left to the private physician.

Iodine should practically never be given to the adenoma without hyperthyroidism and should be given to the adenoma with hyperthyroidism only as a pre-operative measure. Many men do not believe it should be given even as a pre-operative measure to this type of goiter. Certainly its action in this type cannot be foretold as it usually can be in the exophthalmic variety.

In the latter most men feel that iodine should be reserved for use as a pre-operative measure and that it has a good effect but one time. A number of men feel that this effect may be repeated and one felt that it may sometimes apparently effect a cure.

In closing I would like to emphasize the wisdom of always investigating the thyroid in cases of "nervous breakdown," hypertension, nephritis, and heart trouble.



# RÔLE OF THE HEART & BLOOD PRESSURE IN THE SURGICAL TREATMENT OF HYPERTHYROIDISM

ELLSWORTH S. SMITH, M.D., AND HIRAM S. LIGGETT, M.D.  
ST. LOUIS

AS to the importance of the subject, Parry (1815), one of the first to describe the disease, exophthalmic goiter, was most impressed with its cardiac features (Karl von Basedow having given the first classical elucidation of the syndrome in 1840), and we should expect marked disturbances in the circulatory system when we reflect first that in hyperthyroidism there is a tremendous increase in the metabolic processes. This means, of course, a much greater call for transportation of oxygen from the lungs to the various body tissues resulting in a greatly added burden on the heart, which increased work can only be met through increased rate or tachycardia. There are also in this disease marked disturbances in the vasomotor apparatus of the circulatory system, so that at times a condition of hypotension may obtain while on other occasions hypertension may be present depending on whether vasodilating or vasoconstricting endocrine influences are predominating.

Furthermore, as a result of the toxemia present in this disease lesions in cardiac musculature, as fatty degeneration, perivascular round cell infiltration and focal necrosis have been found.

Alluding to damage thus sustained by the thyroid heart Hirschfelder<sup>1</sup> says: "Heart failure is the immediate cause of death in most cases of Basedow's disease." And Plummer states: "In the hyperplastic cases symptoms develop rapidly and more than half the cases of this type seen at the Mayo Clinic came in the first year after the onset of symptoms in which the nervous system is mainly involved. On the other hand, in the non-hyperplastic

cases the toxic symptoms develop after an average lapse of fourteen years and cardiac damage then dominates the picture."

J. Shetland Goodall and Lambert Rogers<sup>2</sup> state that "(1) the cardiovascular condition very largely determines: (a) whether an operation can be undertaken without undue risk; (b) the nature of the operation (whether ligation, thyroidectomy, etc.). And from a paper by Goodall on "The Heart in Graves' Disease," we quote:

"(2) Long-continued mild grade of thyrotoxicosis causes more cardiac damage than a more intense thyroid intoxication for a much shorter period.

"(3) In the majority of cases of Graves' disease hypotension is present and in cases thus running a low blood pressure, the operative risk is less than in those showing arterial hypertension. (In 158 cases of arterial hypertension studied by us two years ago only three cases of affections of the thyroid were found)."

As the basis for the above opinion he states the following:

"(1) Comparatively little myocardial exhaustion (due to absence of strain of hypertension).

"(2) A slighter postoperative rise of blood pressure and therefore less risk of postoperative ventricular fibrillation and sudden death.

"(3) Less risk of hemorrhage."

On the other hand, he quotes Kocher as considering low blood pressure as a source of danger:

"If we find the blood pressure plus normal and the disease highly developed we must study the condition and especially note the action of the heart after exercise and excitement. Under these circumstances we might

find a marked dilatation of the heart, irregularity of the pulse and a blood pressure which cannot be measured by our ordinary methods. A blood pressure of 195 is not a contraindication to operation."

Goodall<sup>3</sup> also quotes Plummer as regarding the height of systolic pressure as an indication of the degree of toxicity.

Boothby<sup>4</sup> writes "In the case of exophthalmic goiter there is an average high systolic pressure, but a rather low diastolic pressure, giving a high pulse pressure. This combination coupled with an increased blood flow indicates a relatively open periphery."

After the above papers which appeared in 1920 and 1921, there is quite a hiatus in the literature of our subject, especially in reference to blood pressure in hyperthyroidism, so much so as to prompt Willard Bartlett<sup>5</sup> in his recent book to say: "Studies in blood pressure seem to have been made, as far as the literature would indicate, much less frequently in connection with Exophthalmic Goiter than the condition warrants."

In fact the next contribution of practical value is that of Lahey<sup>6</sup> on "Goiters Complicated with Heart Disease" in which address he makes the following comments: Thyroidism damages only the hearts diseases before the onset of thyrotoxicosis, and never those normal at the time of the development of the hyperthyroidism; that the cases with normal hearts may develop marked tachycardia, but never at any time any definite evidence of cardiac failure, death in these cases then being due solely to the effect of the acute general intoxication.

(2) The secretion of either the toxic adenomata or exophthalmic goiter produces the same effect on a previously damaged heart.

(3) Thyroid intoxication produces ill effects in previously damaged hearts through so persistently urging the organ to rapid rates and so commonly causes auricular fibrillation to develop.

(4) The damaged hearts thus developing

in hyperthyroidism he calls "thyrocardiac" and he calls attention particularly to such cases being frequently mistaken for ordinary cases of decompensated heart disease due to the symptoms of cardiac decompensation so overshadowing those of hyperthyroidism and thereby robbing the patient of the beneficial effects of surgical treatment.

(5) As to the diagnosis he emphasizes the frequent absence of the classical signs of Basedow's disease and says: "It is only necessary to bear in mind that the underlying 'thyroidism' is obscure and atypical, as compared with thyroidism in the young, and may often be diagnosed only after diligent search through the past history and painstaking observation of the present state." Evidently he is here referring to the group of cases known as "formes frustes."

As to operative end-results in these cases a group of 31 is reported alive two years after operation which averaged twenty months bed disability previous to operation, and at the time of reporting had averaged twenty months up and about. One hundred and forty of the cases with cardiac decompensation have been operated on with 3 operative deaths, that is deaths in the hospital, ethylene anesthesia being used.

In conclusion, he says that in his entire experience in surgery he knows of no situation when patients may be rescued from such depths and restored to such heights in terms of cardiac capacity and physical ability.

The above report of Lahey is of course quite encouraging, applied as it is to a class of cases as a rule most unpromising. Calling attention as he does to the ease with which these obscure cases of thyroid hearts may be overlooked is, we feel, most timely; for this group of cases which Trousseau likened to the defaced coin or forme fruste simulates other diseases most closely, as we had occasion recently to realize very thoroughly in quite an illustrative case—that of a physician who had

for eight years led a life of invalidism with what was considered by several able clinicians a nicotine heart, because probably he had all his life been an excessive user of tobacco. Upon hospitalizing him for intensive study we were finally able to appreciate a very slight Von Graeffe sign and also an almost imperceptible tremor in fingers. A high metabolic rate then disclosed the true nature of the cardiac affection and a subtotal thyroidectomy has afforded him complete relief of his symptoms for now over three years. He is able to play eighteen holes of golf comfortably and enjoyably. We feel that when possible all such obscure cases should be placed in a hospital where they can be kept under daily observation and study, that a correct diagnosis may eventually be reached.

While it must be considered as most important, the subject is in an unsettled state, yet from the data herein presented we may, it would seem, glean the following impressions:

(1) The cardiovascular manifestations in hyperthyroidism are of prime importance and must be seriously considered in estimating the operative risk in a given case.

(2) The condition of the myocardium should be accurately determined through careful electrocardiographic studies preceding operative interference.

(3) The disputed question as to whether

the operative risk is greater with arterial hypertension than with hypotension is in a way settled by the comparative rarity of the former group of cases.

(4) The great importance of hospitalizing for careful observation and study all obscure cardiopaths to the end that the obscure fruste may not be overlooked and the victim robbed of the beneficial results of treatment for hyperthyroidism.

(5) It would seem that Lahey's statement not only previously damaged hearts can be pathologically influenced by the state of thyrotoxicosis calls for further confirmation.

(6) Lahey's surgical results, however, are certainly most encouraging especially just at this juncture when the pendulum appears to be starting away from thyroidectomy.

# REFERENCES

1. HIRSCHFELDER, A. D. Diseases of the Heart and Aorta. Phila., J. B. Lippincott Co., 1918, Ed. 3, p. 684.
2. GOODALL, J. S. and RODGERS, L. Contribution on blood pressure in Graves' disease. *Brit. M. J.*, 1920, ii, 588-590.
3. GOODALL, J. S. The heart in Graves' disease. *Practitioner*, 1920, cv, 37-46.
4. BOOTHBY, W. M. Adenoma of the thyroid with hyperthyroidism (thyrotoxic adenoma). *Endocrinology*, 1921, v, 1-20.
5. BARTLETT, W. Surgical Treatment of Goiter. St. Louis, C. V. Mosby Co., 1926, p. 67.
6. LAHEY, F. H. Goiters Complicated with Heart Disease. *Kansas City Clin. Soc. Month. Bull.*, January, 1927.



# REMARKS UPON THE PHYSIOLOGY OF BONE IN RELATION TO BONE DISEASES \*

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THERE has been allotted to me for discussion the group of bone tumors that are called benign, together with those borderline growths which clinical experience shows to have a tendency toward malignancy, in their relation to some of the newer aspects of the physiology of bone.

In presenting this phase of the subject I have planned for the most part to avoid any descriptive detail of any one type of bone growth, or of entering upon any classification based upon histology, anatomy, prognosis or malignancy; but to search behind this clinical picture screen for the cause or causes of bone neoplasm of whatever histological constituent.

I feel that it is within the scope of this assignment to present certain viewpoints which I have harbored in mind and which appear to me to be fundamental to all bone pathology.

It has seemed to me that not only the benign tumors, but also the associated diseases to which bone is subject, including the group of cystic disease, osteomalacia, Paget's disease and the inflammatory processes, although resulting from different etiologic factors, represent in the main, differences in reactive tendencies towards invasion, in a tissue whose physiology is but poorly understood.

It seemed to me also that it was a faulty starting point to assume a difference in etiology between, for instance, a chondroma and an osteochondroma, and to ascribe for each a special presiding control determining that the one tumor should

consist of cartilage alone, and the other tumor cartilage with a greater or lesser admixture of bone, and to conclude that they must be of an entirely different nature; or, to reconcile the histological similarities between, for instance, Paget's disease and bone syphilis, although arising from totally different causes. It might be worth while to search for some common stock or nature, residing in bone itself, fundamental to all these pathological processes and from which all take their origin.

From this aspect, in the light of our present knowledge, such an investigation will carry one away from a consideration of the bone cell, whose function is very little known, and lead to a consideration of the intercellular material of bone, spoken of as the calcified matrix. It is this material that is the finished product we call bone, and it is here that we must seek the solution of those baffling problems presented in the pathology of bone.

This thought necessarily throws one back upon the embryology of bone, but with this phase I shall burden you as little as may be possible.

Without digressing too far, let me remind you that in 1873 Adolph Kölliker propounded his theory of the multinucleate cells of developing bone. These cells he called "osteoclasts" and considered them the direct agents of bone resorption.

Since that date, this theory of bone production and bone resorption has found its way into medical thought and firmly established itself.

All recent investigations tend to contro-

\* From the Hospital for Joint Diseases. Read before the Section of Orthopedic Surgery, New York Academy of Medicine, May 20, 1927.

vert this theory and in fact attack the very foundations of our hitherto accepted ideas of the physiology of bone.

It is largely the results of American research that have denied to the osteoclast and to the osteoblast the functions attributed to them in the development of bone. Prominent among the names of workers in this field are Lewis, Shipley, Macklin and Arey.

As stated by Arey<sup>1</sup>: "The conclusions of Kölliker regarding the history and signif-

that "There seems to be no satisfactory evidence that the osteoclasts are the active causes of bone destruction. On the contrary, they appear to be degenerating cells."

Concluding this digression, I would add that this theory has greatly retarded our search of the truth, and has stood as a barrier successfully staying any scientific advance to the understanding of the physiology of bone.

To me it has been astonishing to find

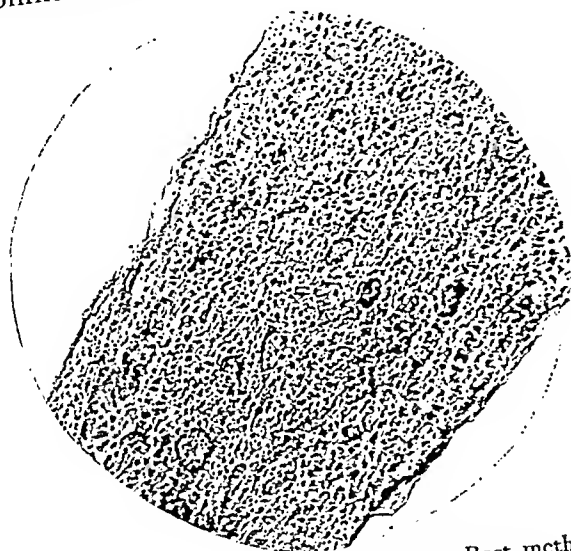


FIG. 1. Adult rat skull, full thickness, Bast method, showing lacunar cells and Haversian canals.

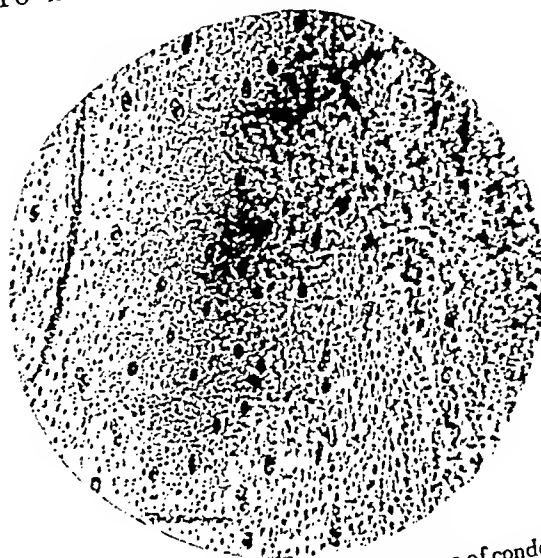


FIG. 2. Fetal guinea-pig skull, showing area of condensation, rich in cells, chondromucoid substance and Haversian canals. Periphery shows intercellular matrix in which lime salts will be laid. Notice avascularity of large areas.

icance of the osteoclasts have gained great prominence. It should be kept clearly in mind, however, that his opinions were almost wholly inferential. He neither offered direct proof of the origin of osteoclasts nor of their fate. The apparent reasonableness of these deductions, and the prestige of their originator doubtless account for their acceptance by numerous later investigators and for their widespread inclusion in texts." And in his careful and elaborate study, he concludes, "In working over this field and evaluating the total evidence, the writer has become highly sceptical concerning the potency of the osteoclasts in bone resorption."

With Lewis, he would take the position

how tenaciously the authors of many recent textbooks and surgeons of the present day, fail to incorporate the products of this newer research and apply it to their daily problems.

Approaching, therefore, the study of the structure of bone, it appeared to me that bone must be examined in its natural state and not after the introduction of the various artifices entailed in decalcification and sectioning.

I have long maintained the point of view that it is the organic intercellular matrix that is the element of bone structure that holds the key to the problems of bone physiology and not the multinucleate cells.

This organic intercellular matrix is a collagenous material, the product of a specialized differentiation of the mesenchyme, and appears to possess the unique biologic feature that I would call for want of a better term "calcium coagulation."

This collagenous material shows no cellular structure but, after the ordinary fixing methods, shows numerous long striations. Although, as just stated, there is no visible cellular structure in the organic matrix before calcification, after calcifica-

tion is diffuse and shows no evidences of crystallization. Decalcification of such bone sawdust shows the same organic matrix seen in other preparations.

Pathological bone treated in the same manner, shows the same calcified units, but their contours are irregular, many are bent or irregularly curved, the calcium is irregularly distributed and they show a tendency to bizarre shapes. There are locations where there looms into prominence in the midst of such a unit, a well-

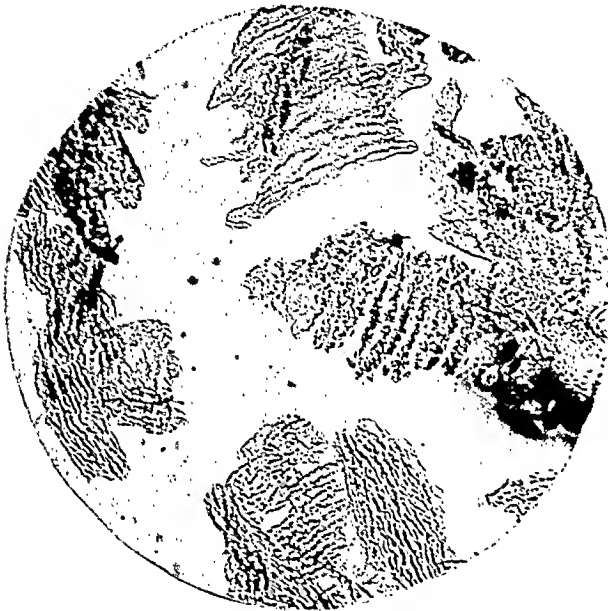


FIG. 3. Sawdust made from normal ox bone. Calcified trabeculae lying in rows.

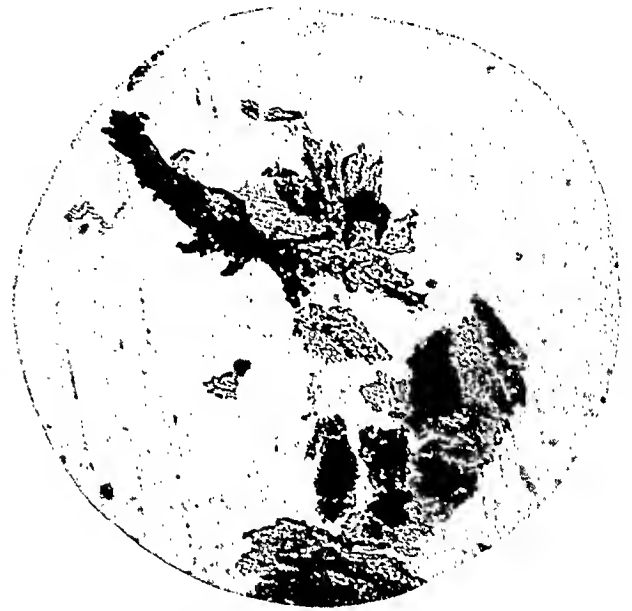


FIG. 4. Bone sawdust, metastatic carcinoma. Trabeculae irregularly shaped, irregularly ossified.

tion a definite structure can be made apparent.

If sawdust is made from normal bone cortex, using a fairly fine saw, and stained by any method, the constitution and structure of the calcified matrix can be studied. Examinations have been made of such sawdust from normal human bone, pathological human bone, and bone of the ox and the rat.

In normal human, ox and rat bone there is practically an identical structure except for some trifling variation in the size of the calcified units.

The general contours of these units are spindle-shaped, sometimes lying singly but more frequently lying in rows; their length and width are uniform, the calcium dis-

tribution is diffuse and shows no evidences of crystallization. Decalcification of such bone sawdust shows the same organic matrix seen in other preparations.

These bodies represent bone trabeculae and demonstrate that calcification is not a diffuse process extending through a homogeneous intercellular material, but that there are definite and regular limitations of the pre-osseous collagenous substance which define the size and configuration of each trabecula.

It would be hazardous indeed, in our present knowledge, to call these bodies cells, even though their contours are not dissimilar to a connective-tissue cell, and though occasionally in pathological bone a structure like a nucleus has been seen.

In the attempt to study the bone matrix before calcification, it was planned to



employ the agency of vital staining using pregnant rats. Although this appeared to be a ready solution to a difficult problem, it was found that the parent animal became deeply stained and that the placenta successfully filtered all of the excess dye and that not a particle of the stain could be found in the fetus. The placenta provides complete protection of the fetus from the diffusion of the dye.

Although it is usually stated that vital staining stains the bones, in our experi-

into a fibrillar network which later becomes impregnated with the salts of lime and produces bone.

This colloid material can be more readily studied in the vitally stained animal and can be seen before the fourth day. The neighboring structures are intensely stained while this bone juice remains colorless. This material can be differentiated from blood serum. The latter takes the color of the dye, whereas this bone juice remains colorless.

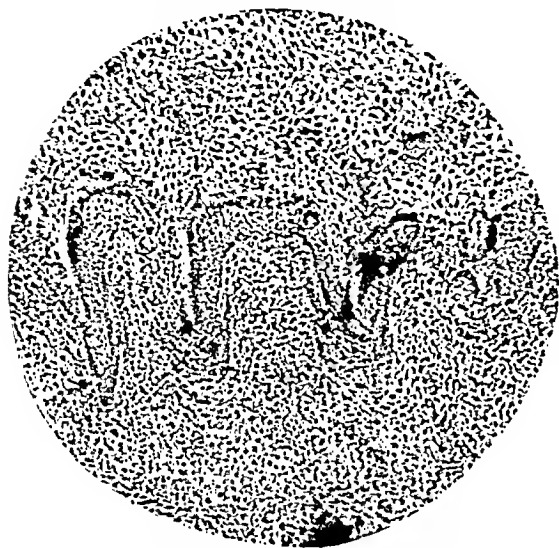


FIG. 5. Rat skull, adult, vital staining, showing suture line.

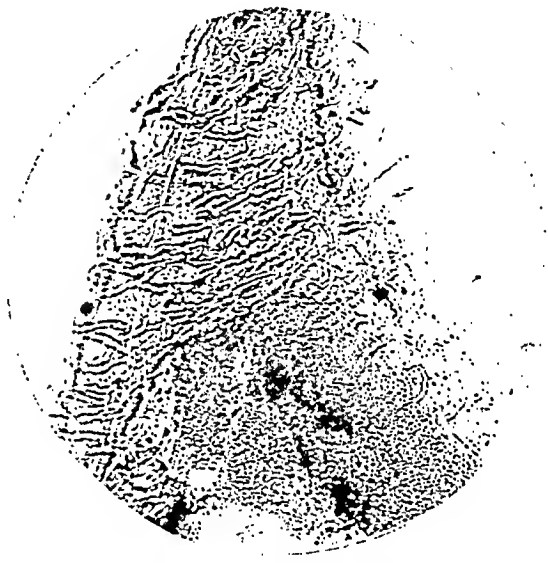


FIG. 6. Adult rat femur, cross section, vital stain. Marrow cavity and crest of femur, showing distribution of Haversian canals.

ments (using trypan blue mostly, but also alizarin and litmus) the bone matrix did not take the dye, but the connective tissues of the periosteum and ligamentous structures were deeply stained. The blood vessels and Haversian canals could often be seen stained.

Leriche and Policard<sup>2</sup> in their recent book upon the physiology of bone, speak of a gelatinous liquid that occurs about the ends of fractured bones and that can be seen at about the fourth or fifth day after fracture. They refer to Gerdy who in 1855 described this material, which was spoken of by the older writers as "suc osseux" or bone juice.

Leriche and Policard have watched the transformation of this gelatinous material

I believe that this gelatinous material represents an early form of pre-osseous material and provides the framework for the structure that is destined to become callus and later bone.

The origin of this material is purely conjectural, but it is likely to be a product of the organic bone matrix, for if it came from any other source, it would be likely to carry with it the color of the dye.

A tremendous amount of labor has been spent upon the problem of the ossification of the pre-osseous substance. In early fetal life the mesenchymatous structure, by a process of condensation, undergoes a differentiation into transitory cartilage. Further condensation occurs, and nuclei appear.

This embryonic cellular cartilage is composed of large, vesicular, polyhedral or irregularly rounded cells, among which is found a small amount of chondromucoid ground substance which surrounds the cells.

This chondromucoid intercellular substance forms more or less complete septa and represents the embryonal matrix into which the bony material will eventually be laid.

A further differentiation, apparently

Here again, therefore, from an embryological standpoint we have a very definite statement that the calcification of bone is not the product of the activity of the cells of bone, but is a further differentiation of the organic matrix of bone.

From the purely inorganic chemical angle all research into the problem of bone production has signally failed.

From this chemical angle Watts<sup>4</sup> has made a series of microscopic investigations of the action of the two salts in aqueous

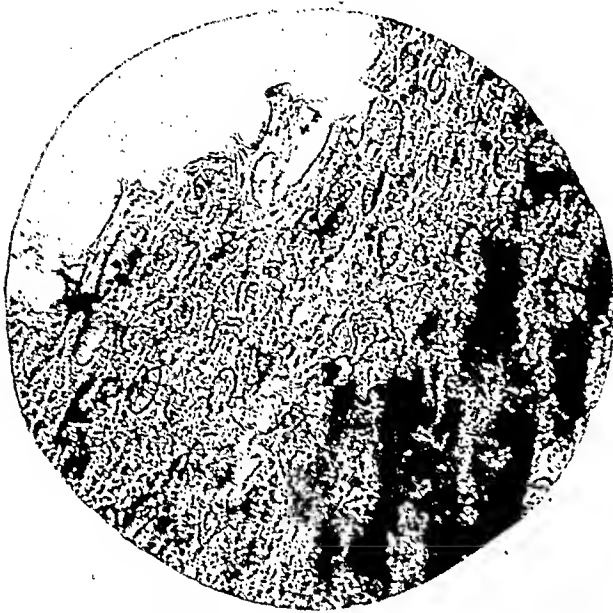


FIG. 7. Femur, one week-old guinea-pig, vital stain; incomplete ossification; open Haversian canals; bone cells in pre-osseous tissue.

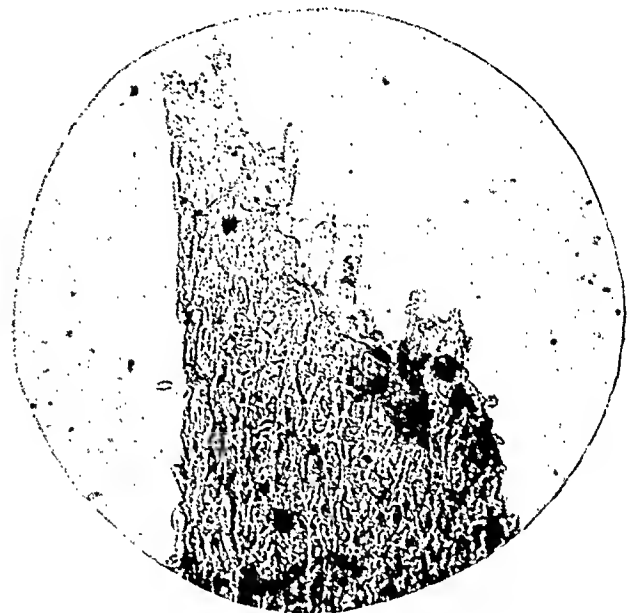


FIG. 8. Rat femur three days old. Incomplete ossification of trabeculae.

unaided by the cellular structure, occurs in this matrix producing a hyaline appearance, giving each cell the appearance of being surrounded by a distinct cell membrane.

The careful study by Carey<sup>3</sup> of the minute consecutive changes in the early stages of the development of bone leads him to the following conclusions: "It is clearly demonstrated that degeneration of the parenchymatous cartilage cells and calcification of the intercellular cartilaginous matrix are not processes intrinsic to the cells involved, as one is led to believe by reviewing the literature of these changes in early primary bone development, but are the natural resultants of the differentiation of the fibroblastic perichondrium."

and colloid solutions. His experiments would warrant no conclusion applicable to the matrix except, perhaps, the negative one, that calcification is not the result of direct precipitation.

On the other hand, the illuminating experiments of Shipley, Kramer and Howland<sup>5</sup> demonstrate the avidity of the decalcified matrix for the salts of bone. They placed pieces of cartilage and bone of rachitic rats in normal rat serum and calcification occurred. The calcium phosphate is deposited in the intercellular matrix and never in the cytoplasm of the cells themselves, just as is the case when healing occurs in vivo.

Shipley found, furthermore, that, calcification does not begin on the surface of

the slice of tissue as one might expect *a priori*, but the first deposits of lime salts are in the depths of the cartilage and the process gradually extends to the surface.

Numerous attempts have been made to produce calcification in pieces of dead cartilage, but these experiments fail to show calcification.

In summarizing, these authors conclude: "It is impossible to advance any theory to explain the selective deposit of the calcium salts. The process is clearly not one of simple precipitation. It depends upon the activity of living tissue."

From this survey of the pre-osseous material and of the process of ossification, it seems demonstrated that the vital substance of bone structure is the collagenous intercellular material, and that the aberrations of bone, as presented in its pathologic states, must find their chief cause in this substance.

What theory, then, can be offered in the place of the one hitherto held?

It must be understood at the outset that any theory of the physiology of bone must account not only for normal bone production but also, through aberrations of this normal physiology, for the manifestations presented in disease, including processes reactive to bacterial or other invasion, and tumors of bone.

In other words, the test of accuracy of any theory, is its flexibility to accommodate its application to all conditions that may properly fall within its scope.

If we will accept, therefore, as a first premise, as stated above, that the vital substance of bone structure is the collagenous intercellular material, the problem at once falls within the domain of the chemistry of the colloids.

A fact not mentioned before is the avascularity of the pre-osseous tissue. This substance is devoid of blood vessels to such a degree that it forces the inference that the salts of lime, namely calcium phosphate and calcium carbonate, already in the proper ratio, must be an inherent part of the collagenous matrix.

If we will concede that the intercellular substance of bone consists of such a colloid body which contains in its substance the specific elements of bone, it becomes easy to conceive how by biological activity, which I have elsewhere spoken of as "calcium coagulation," bone formation might readily be established.

This conception does not involve any new or unknown action of colloid matter but is entirely parallel with the action of certain colloid substances both inside and outside of the living organism. Examples of such biological colloid mutations occur, for instance, in the development of the teeth, the exoskeletons of various animals and, probably, in the formation of gallstones and other concretions.

The property of reversibility which is peculiar to colloids would amply explain the destructive processes of bone absorption and osteolysis.

This conception would, therefore, give the place of first importance to the collagenous intercellular matrix, and regard it as a tissue that retains its vitality and holds in a reversible colloidal state the inorganic salts of bone. Any influence, be it chemical, bacterial, vascular, nervous or glandular, would exert its effect upon this substance, which in turn, would be reflected in a corresponding alteration in the calcified content.

An explanation of the pathology of bone, however, rests not merely upon an explanation of the mobilization of the calcium content, but also upon the mutations of the organic matrix, released from its calcium salts.

The decalcified matrix, in view of its closely related functions and derivations from a common ancestral mesenchyme, might be converted into or replaced by any form of connective tissue or cartilage, might degenerate into cysts or might undergo malignant change.

This facility for changing the type of specialization is sometimes referred to as "plasticity" and is especially pronounced in tissues of the connective tissue type.

A mechanism such as the one described, would give us, I believe, an explanation for all the various phenomena presented in the pathologic states of bone.

To be more specific, how, then, may this theory be applied to some of the common lesions of bone?

In osteitis fibrosa cystica, the fibrotic change is paramount. The bony trabeculae lose their calcium content. Decalcification and calcification are simultaneous processes. Areas of complete decalcification are seen; in these regions the organic matrix appears to have undergone metaplastic changes and healthy young connective tissue may be seen, or areas of new cartilage formation.

The fibrosis may extend throughout the marrow cavity. Decalcification of the cortical bone occurs with fibrous replacement involving the entire structure leaving only a shell of lamellar bone, covered by periosteum.

Along with this fibrotic change is a strong tendency to the formation of cysts. The formation of cysts is most probably the result of regressive changes of fibrous tissue, which completes its cycle in the stage of liquefaction. Whether these cysts are primary or part of a more complex bone lesion, their mechanism is probably the same.

The mechanism of the production of osteomyelitis affords a striking example of this theory. Contrary to other lesion in which the decalcified matrix undergoes metaplastic changes, in osteomyelitis, owing to bacterial invasion or circulatory disturbances, the organic matrix itself undergoes devitalization and death. There follows, in consequence, an inhibition of further biological influences upon the calcified colloid, resulting in a mass of dead, inert calcific material, destined to become sequestrum and dependent upon molecular disintegration for its removal.

The relationship between new bone formation and the organic matrix of bone in osteogenic sarcoma, has been discussed by me in a previous publication.<sup>6</sup>

## REFERENCES

1. AREY, L. B. The origin, growth and fate of osteoclasts and their relation to bone resorption. *Am. J. Anat.*, 1919-20, xxvi, 315-337.
2. LERICHE, R., and POLICARD, A. Les problèmes de la physiologie normale et pathologique de l'os. Paris, 1926.
3. CAREY, E. J. Direct observation on the transformation of the mesenchyme in the thigh of the pig embryo. *J. Morphol.*, xxxvii, 1922, 1-53.
4. WATTS, J. C. Behavior of calcium phosphate and calcium carbonate (bone salts) precipitated in various media, etc. *Biol. Bull.*, 1922, xlv, 280.
5. SHIPLEY, P. G., KRAMER, B., and HOWLAND, J. Studies upon calcification in vitro. *Bio-chem. J.*, xx, 1926, 379-388.
6. EISING, E. H. Bone formation in osteogenic sarcoma. *Arch. Surg.*, 1926, xii, 867-886.

## Discussion

DR. MAX A. GOLDZIEHER (by invitation):

It is a very important point in the preceding paper that growth of bone tissue or destruction of bone is not a product of osteoblast or osteoclast activity, respectively. For many years pathology was and still is hampered by the conception of absolute tissue and cell specificity. The basic truth of the statement that every cell derives from another cell of similar character is of course still to be maintained, particularly in the teaching of pathology to medical students, but the exceptions from this rule are many and should not be overlooked. It is a fact that bone tissue and cartilage are usually formed in the fetus and later in life from a bone or cartilage matrix, or from the specific periosteal and perichondrial tissue. On the other hand, it cannot be denied that both cartilage and bone can be formed quite independently as, for instance, in obsolete tuberculous foci in the lungs. Bone formations in such foci contain all the features of real bone tissue and often include channels filled with regular bone marrow. Similar observations in general pathology indicate that the formation of bone is not a specific property of specific cells or "osteoblasts." It rather seems that connective tissue cells of any kind may produce bone as a result of some, as yet unknown, stimulation.

The question comes up whether the matrix of the bone tissue, which of course is not the product of the so-called osteoblasts, is an independent living substance as described in Dr. Eising's paper, or whether it should be regarded as an intercellular material dependent on some cells as to both nutrition and function. The

## Eising—Physiology of Bone

conception of an independent acellular matrix is certainly new and striking, but it is questionable that there is enough evidence to maintain such a point which is in contradiction to our general knowledge of live protoplasm. I would rather feel inclined to believe that the bone matrix is the product of some cells and still remains under the influence of these cells so far as nutrition and function are concerned, similarly to the behavior of the collagenous connective tissue fibrils.

Of utmost importance in Dr. Eising's paper is the emphasis laid upon the colloidal chemical aspects of bone pathology, particularly so far as calcification and decalcification are concerned. It seems to me that the conception of decalcification on the basis of simple colloidal chemical processes such as occur *in vitro*, can be well maintained. On the other hand, I don't feel confident that the process of calcification will be ever repeated *in vitro* experiments, as calcification of bone seems to be dependent on the action of living cells. I am purposely differentiating here between the diffuse calcification of bone tissue as a vital process and the precipitation of coarse granules of lime in and about necrotic tissues or exudates. In studying the formation of bone and the processes of calcifica-

tion and decalcification, respectively, by far the best material available is that of bones with osteomalacia or rickets. In such conditions, even better than in embryological specimens, it can be demonstrated that calcium content and formation of bone matrix are two totally different processes, although physiologically constantly combined. While in both pathological conditions there is a resorption of bone tissue including both the calcium and the matrix, there is simultaneously formation of matrix without calcium surrounding the bone trabeculae as a limeless seam. It has been definitely shown that these osteoid seams are not due to decalcification, but to deposit of straight limeless osteoid. If the pathological process tends toward healing, the osteoid tissue, which is often quite bulky, reveals intense calcification. There is absolutely no evidence to show that secondary calcification of osteoid has anything to do with the activity of osteoblasts and there is no better explanation for this process than that of some colloid chemical changes in the osteoid which, however, cannot be demonstrated but in live bone tissue. It seems, therefore, that such calcification of osteoid tissue is dependent on the vital function of cell elements within the bone matrix.



# TONSILLECTOMY BY ELECTROCOAGULATION\*

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PORTSMOUTH, N. H.

I N the process of destruction of tonsillar tissue by electrocoagulation the equipment is no small factor. I am not qualified nor do I wish to discuss the various high frequency machines except to say that it is necessary to have a machine that will deliver a current of low voltage and high amperage and will not produce any sensation except heat. One should have a good head light and place the patient at a convenient distance from the machine.

The current is tested to register just under 1500 ma. If the patient is unable to control the throat when the tongue depressor is used a 5 per cent solution of cocaine in a 50 per cent solution of adrenalin is brushed over the base of the tongue. Sometimes a second application is necessary. No other anesthetic is used. The patient holds a metal rod connected to one pole and the operator uses an applicator with a small metal point insulated to within one-third inch of the end which is attached to the other pole of the machine. This point is brought in contact with the tonsil. Begin at the center of the lymphoid tissue and do not get very near the edges until the patient has gotten used to the method and over his fear. After he finds that he is not going to be hurt, a little disagreeable sensation caused by getting against the pillars will be overlooked and almost unnoticed. The current is switched on with the foot and each individual contact is continued long enough to produce distinct blanching. Then the foot is removed from the switch and the metal point is moved to another place.

The amount done at each sitting depends on the size of the tonsil and on the patient. The first treatment should usually be

short, because the patient is usually a little frightened and under some nervous strain. Many times I do only enough to let him see what it is like. There is rarely any trouble in doing as much as you think necessary after the first treatment. Each individual sitting requires a very short time so there is no reason to be in a hurry.

The thing that I regard as most important is not to use so much current as to coagulate too deeply. That, I think, is the cause of hemorrhage when the slough comes off. I have had one patient who bled because, I am sure, too much was done at a time with too strong a current.

Treatment can be repeated in about ten days as that is about the time for the coagulated tissue to separate. The number of treatments varies with the size of the tonsil and its consistency. The soft, mushy tonsil will disappear much faster than the hard fibrous type. It is obvious that this method is adapted to the small tonsil and to the adult tonsil that is not only small but irregular and hard to get at by the usual method also to the patient who is a poor surgical risk. By electrocoagulation there need be no portion left behind which so often happens in the surgical procedure.

I have used fulguration to destroy tonsils but have found electrocoagulation more rapid and less painful, and with it I have had less difficulty in getting the last bit of tonsil. My experience tells me that if the tuberculous patient is relieved of his infected tonsils his recovery will be made less difficult. Electrocoagulation stirs up no infection in the throat and it can be used safely even when the tonsil is acutely inflamed. In fact, it seems to be of value to

\*Read before the New England Association for Physical Therapeutics, May 18, 1927.

## Greeley—Tonsillectomy

the remaining uncoagulated tonsil by its sterilizing effect. One does not have to wait for his patient to improve in health before this method is begun.

Just a word regarding tonsils themselves. Do not forget that they are all diseased. If you find small innocent pale tonsils and you tell your patient that his tonsils are all right and should be let alone you are in danger of doing him a great injustice. This sort of tonsil has no drainage except into the blood stream and can thus be compared to the innocent looking tooth with an abscess at the apex, while the rotten-looking tonsil, with open crypts discharging pus into the throat may be compared to the tooth with pus discharging around it. In the first case toxins are being absorbed, in the latter they are going into the mouth and stomach. In the work of detoxication for the cure of disease we must

not forget that in order to succeed all infected areas must be removed.

Briefly, the advantages of electrocoagulation are these: The patient does not have to take an anesthetic, is not made ill, can go about his tasks, and can eat and enjoy life as usual; no matter how badly infected the tonsil or how acute the inflammation, treatment may be started. Instead of stirring up the infection and increasing the toxic absorption electrocoagulation or surgical diathermy actually destroys the infection in the part of the tonsil not coagulated, so it often happens before tonsil takes on a healthy appearance that it is completely destroyed. By this method the tonsil may be removed completely and by having the patient come to the office after a year it is easy to keep the throat free of lymphoid tissue if any should develop.



## [SURGICAL SUGGESTIONS]

TWO important principles apply in the surgery of chronic osteomyelitis: First, the bone itself should not be attacked until a sequestrum has definitely formed. Second, the simple removal of sequestra may be all that is necessary to effect healing, in spite of overhanging healthy bone. As a rule, simple sequestrectomy should serve as a primary operation. The shallow bone trough may be required to effect definitive healing, but plastic osteotomy may be wisely deferred until its necessity and extent are definitely indicated.



# BILATERAL COMPLETE CERVICAL FISTULAE

WARREN WOODEN, M.D., AND DON K. HUTCHENS, M.D.

ROCHESTER, N. Y.

REPORTED first by Huncyowski in 1789, differentiated from midline fistulae by Acherson in 1832, placed on an embryological basis of branchial cleft origin by Hensing in 1864 and convincingly attributed to thymic origin by Wenglowksi<sup>13</sup> in 1912, an extensive bibliography of

chial apparatus cannot leave remnants in the neck below the hyoid bone; and, third, because this hypothesis furnishes an exact analogy to the tract left by the embryological progress of the thyroid.

The anatomical relations of the complete fistulae are subject to some variation, but



FIG. 1. Before operation. Note pit of first branchial cleft.



FIG. 2. One year after operation.

lateral fistulae of the neck has developed, with but scant reference to complete fistulae on both sides. A case reported by J. D. Whitham,<sup>14</sup> during 1926, which exactly corresponds to the one here described, and a case mentioned without details by C. Eggers<sup>6</sup> in discussion of a paper by Willy Meyer,<sup>12</sup> seem to constitute all available references to this phase of the subject.

Accepting the embryological studies of Wenglowksi, recently reviewed by Christopher, it seems inevitable that these fistulae must be classified as of thymic origin, first, because they correspond in location to the tract left by developmental descent of the thymus; second, because the bran-

the findings are usually constant: they extend from the skin surface, anterior to the sternomastoid muscle, to the hyoid region, under the digastric muscle, through the bifurcation of the carotid artery, under the styloglossus and stylopharyngeus muscles, over the glosso-pharyngeal and hypoglossal nerves and into the lateral wall of the pharynx in the region of the posterior pillar of the tonsil.

The surgical extirpation by radical dissection with addition of inversion of the pharyngeal terminus as devised by von Hacker should fulfil operative requirements. To lessen the difficulties of a rather formidable dissection, it may be remarked that the tract, injected with solution of gentian violet is indicated adequately because of its transparency, that colonic anesthesia gives superior operative convenience, and that in event of failure to locate the internal opening at the final stage of the operation, a passage of the ligated terminal portion through a deliberately made opening, presumably near the natural one, may be expected to effect a cure.

#### CASE REPORT

CASE No. 32701, Rochester General Hospital.

A boy, aged seven years, was brought to the Out-Patient Department because of a constantly "dirty neck." Since birth the typical lateral openings had discharged thin material, especially at meal time, and had necessitated the wearing of dressings. A period of blocking and cyst formation had never been experienced. A probe could be passed into each sinus about 3 cm., mastication of a methylene blue tablet brought prompt appearance of the color externally, and an injection of bismuth in olive oil permitted a fair outlining of the tract by roentgenogram. There was nothing of importance in the physical examination or family history.

On November 18, 1925, complete extirpation was done on the right side under colonic ether anesthesia. The above-mentioned anatomical relations were defined and the tract was

dissected free with some difficulty to within 1 cm. of the pharyngeal entrance. After prolonged and vain search for the inner opening the ligated end was forced through the pharyngeal mucosa at a point presumed to be near the natural opening, and sutured to the posterior pillar. An uneventful recovery was made, leaving a satisfactory scar externally and no trace internally.

After a period of delay due to a series of routine throat cultures exhibiting Klebs-Loeffler bacilli, an identical procedure was carried out successfully on the left side on January 20, 1926.

On follow-up visit one year and a half later, this case exhibits a very satisfactory cosmetic and anatomical cure (Fig. 2).

#### REFERENCES

1. BEVAN, A. D. *Surg. Clin. Chicago*, 1920, iv, 1.
2. DE GAETANO, *Riforma Med.*, 1925, xl, 889.
3. DOUGLAS, J. Branchiogenic cyst with sinus leading into pharynx. *Ann. Surg.*, 1918, lxvii, 240.
4. DOWN, C. N. Complete branchiogenic fistula. *Ann. Surg.*, 1916, lxiii, 519-522.
5. EDWARDS, A. Cutaneous manifestations in a case of cervical fistula. *Brit. M. J.*, 1920, 1, 326.
6. EGGERS, C. (In discussion). *Am. J. Surg.*, 1926, 40, 121.
7. GILMAN, P. K. Branchial cysts and fistulas. *J.A.M.A.*, 1921, lxxvii, 26-28.
8. KRAMER, R. Lateral cervical fistulae. *Laryngoscope*, 1926, xxxvi, 517-522.
9. LILIENTHAL, H. Branchial fistula. *Ann. Surg.*, 1922, lxxv, 110.
10. LIPSCHUTZ, B. A contribution to the study of fistulae and cysts of the neck. *Ann. Surg.*, 1924, lxxix, 400.
11. MCKINTY, F. E. Tumors of the neck. *Surg., Gynec. & Obst.*, 1914, xiv, 141.
12. MEYER, H. W. Congenital complete branchiogenic cyst and duct. *Am. J. Surg.*, 1926, xl, 121.
13. WENGLOWSKI, R. Ueber die Halsisteln und Cysten. *Arch. f. klin. Chir.*, 1912, xcvi, 151-208.
14. WHITMAN, J. D. *Am. J. Surg.*, 1926, xl, 10.



# INTERSTITIAL ECTOPIC GESTATION, OPERATION, RECOVERY: A CASE REPORT

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WE report this rare case without reviewing the literature, which is not accessible to us in this small town. In interstitial pregnancy the ovum is arrested in that portion of the tube that is within the uterine wall. Polak says,<sup>1</sup> "Pregnancy in the interstitial portion of the tube may terminate:

"(1) By death of the ovum.

"(2) By expulsion of the ovum into the uterus, in which case the pregnancy may terminate as an abortion or proceed and develop as an intrauterine pregnancy.

"(3) *By rupture into the peritoneal cavity with death of the mother from hemorrhage and shock. The woman but rarely survives interstitial rupture.*

"(4) The ovum may rupture into the broad ligament, etc."

The ovum developing within the walls of the uterus, though outside the uterine cavity, rupture of the sac ordinarily occurs much later in this type of extrauterine gestation than in the more common forms, and the difficulties of diagnosis are much greater because of the closer resemblance of the condition to normal pregnancy. Bland<sup>2</sup> says, "A gestation developing in the uterine or cornual section of the Fallopian tube occasionally occurs and is infinitely the most serious type of ectopic pregnancy," and "Interstitial pregnancy forms the most dangerous, as well as the most fatal type of the condition."

## CASE REPORT

Our patient, white, aged 23 years, has two normal children by a previous marriage. Her present marriage was less than a year before her present illness. Previous labors were normal except that three years ago she had a rather

<sup>1</sup> Polak, J. O., Manual of Obstetrics. Ed. 2., N. Y., 1922, p. 265.

<sup>2</sup> Bland, P. B. Gynecology, Medical & Surgical. Phila., 1926, ii, 826.

difficult labor which terminated spontaneously. No previous history of abdominal trouble. Nothing significant in her family history.

The patient was rather doubtful that she was pregnant. Her last menstruation was March 15, 1927. Her disability developed with vomiting, following a severe follicular tonsillitis. She complained of an occasional slight pain throughout her abdomen one week before operation, but she failed to localize it and thought very little of it.

On April 6, 1927, at 8:30 P. M. she suffered a very severe pain in the abdomen, at first most pronounced on the right side, but later general in character. She failed to receive any relief from this pain. It was spasmodic, lasting from five to fifteen minutes, with free intervals.

She was first examined at 10:00 P. M. that night when she was in severe pain. Her expression was not pronouncedly changed. Her abdomen was very tender all over, but especially over McBurney's point. The pain was increased by deep respiration and by any movement. She was very rigid over the entire abdomen, especially in the right iliac region. Palpation anywhere over the abdomen elicited pain which was referred to McBurney's point. Pulse was 74, temperature 98°. The chest was negative. The uterus was found enlarged to the size of a two or three months pregnancy, therefore, larger, than was to be expected from the history. The cervix was rather firm and long, with no discharge of any character. Palpation of the adnexa impossible because of the tenderness.

The patient was taken to St. Joseph Sanitarium at Del Norte at midnight, and on admission was reexamined. The tenderness and rigidity were less marked over the left side but were pronounced over the appendiceal region. Every deep breath evoked a spasm of pain, which now became definitely localized in the lower right abdomen. The facies were normal.

At 4:00 A. M. the patient showed signs of a moderately severe anemia and became anxious. Diagnosis was then made of a surgical abdomen due perhaps to a fulminating suppurative appendicitis or ruptured ectopic pregnancy.

On April 7, at 5:30 A. M. operation under ether anesthesia. A low right rectus incision was made by one of us (Gjellum). On opening the peritoneal cavity there was an enormous gush of fresh blood and many large and small clots. An intact fetus of from ten to twelve weeks was delivered with the unbroken sac through the abdominal incision. It was lying free in the abdominal cavity.

Palpation of the uterus showed a large rent two or three inches in diameter on the superior half of the musculature at the tubo-uterine junction. The free tube was normal and uninterrupted in its continuity. The rest of the uterus was also normal. The tear did not go through so

as to communicate with the uterine cavity. Its base was in the musculature of the superior horn. The rent was repaired by catgut, the sutures beginning from the bottom of the cavity and being placed in layers upward. The whole was covered with peritoneum.

The peritoneal cavity was cleansed of all clots and free blood. A small cigarette drain was left in it. The entire procedure lasted 80 minutes. During the operation hypodermatoclysis and intravenous saline infusion with digalen, 15 minims, and adrenaline chloride solution (1:1000) were administered.

The patient made an uneventful recovery and was discharged cured in two weeks.

#### [SURGICAL SUGGESTIONS]

**I**N chronic osteomyelitis, to chisel away healthy or more or less necrotic bone before there is a complete sequestration is not a good practice, though a common one; it is an operation in which, in the nature of things, one does too much or too little. Every chisel stroke, every scrape of the curette is an invitation to fresh sequestrum formation; and the extensive osteotomy often serves to delay rather than to hasten the cure.

**S**TAPHYLOCOCCUS aureus, the common invader of bone, and streptococci may lie dormant in the osseous tissue for many years after the storm of the acute osteomyelitis has passed and then, reactivated, may produce a more or less violent recrudescence of the disease or, more commonly, may reveal their presence by some milder process of suppuration or necrosis.



# TRANSACTIONS OF THE SECTION OF SURGERY NEW YORK ACADEMY OF MEDICINE

*Meeting of May 6, 1927*

DR. EDWARD C. BRENNER, PRESIDING

## PERFORATED ULCERS OF THE DUODENUM

A REPORT BASED UPON 27 CASES

EDWARD C. BRENNER, M.D., F.A.C.S.

*(Abstract)*

IN this most dramatic of acute abdominal crises, operation within the first twelve hours with simple closure of the perforation will terminate in recovery in the vast majority of cases. The question is whether such ulcers are cured by simple inversion closure and the patients remain well and asymptomatic.

The normal motility mechanism is badly deranged by gastroenterostomy. Normally the acid chyme when it flows into the duodenum transforms the prosecretin into secretin and thus establishes pancreatic secretion. The churning movement of the duodenum intimately mixes the chymified food with the bile and pancreatic ferments and then passes it into the jejunum. Gastroenterostomized patients are subject to a change that may be termed revolutionary insofar as the physiology of their digestion is concerned. Gastric contents that are improperly prepared enter the jejunum which in consequence must do the work of the duodenum, a part of the process of digestion for which it has no physiologic fitness. The subjective and objective sequences of this digestive dysfunction may be pain, vomiting, diarrhea—in fact the whole gamut of dyspeptic signs and symptoms. That many of these patients thrive despite this handicap only shows the adaptability of the human economy.

It is nevertheless true that gastroenteros-

tomy performed for the purpose of relieving scar tissue obstructing the pyloroduodenal orifice is, in the majority of cases, an entirely satisfactory procedure. In such cases of obstruction there has existed for some time an altered function, both motile and secretory, mostly of the stomach, to a less degree of the duodenum. For that reason, one chooses the lesser of two evils and makes a short-circuit, trusting to nature's well-known tendency to establish a satisfactory balance.

Conversely, it is well known that in the absence of true pyloroduodenal stenosis, gastrojejunostomy is often fraught with disaster; for several months the patient is likely to be comparatively free from symptoms but later results may be most disappointing.

The cardinal indication therefore, for gastrojejunostomy would be actual or organic stenosis.

This form of stenosis did not obtain in the majority of the 27 cases and the impression would seem to prevail that in relatively few perforations from duodenal ulcer does real stenosis occur.

Moreover it must be remembered that nature overcomes many apparent stenoses. This fact is well demonstrated in 3 cases, which were subsequently operated on for other conditions.

The duodenum in all three cases was restored to normal yet apparent stenoses presented at the time of perforation, and in one case it was so pronounced that a primary gastrojejunostomy was added.

### **PATHOLOGY**

The true surgical ulcers present five general types:

1. The large ulcer with much scar tissue formation encroaching upon the lumen of the duodenum and accompanied with more or less extensive extrinsic adhesions.

2. The medium-sized ulcer with moderate scar tissue infiltration, without narrowing of the lumen.

3. The small ulcer with a non-indurated or only slightly indurated base.

4. The acute necrotic ulcer.

5. Multiple ulcers, including the so-called "kissing" type.

Clinically most acute duodenal perforations are those of Types 2, 3 and 4. There is a remarkable monotony of appearance in these lesions. They are simple, single, round, slightly indurated, 1 cm. to 2 cm. in diameter, on the suprapapillary part of the duodenum (the proportion is 450 to 1) and nearly always in the first 1½ inches of the anterior or superior surface. Those occurring at the junction of the pylorus and duodenum are probably for the most part duodenal. In these the pyloric veins are often obliterated. Much less than half of these ulcers present adhesions to neighboring structures, the gall bladder, liver, colon, stomach and omentum. It is my opinion that most ulcers that perforate suddenly are non-adherent to adjacent viscera, and when adhesions are present they are almost invariably of recent origin. Disease of the appendix and gall bladder is a frequent concomitant.

The perforation is usually 2 mm. to 5 mm. in diameter, a typically punched-out hole in the crater of the ulcer. If carefully examined it will be noted that the entire ulcerating portion is extruded as the result of embolism or thrombosis. The remaining peripheral induration is the protective zone that accounts for the rapid healing of the lesion after closure. I believe that in many cases this induration is soon absorbed and the duodenum is restored to its normal condition without any macroscopic evidence of previous disease. Thus one seems justified in stating that lesions of types 2, 3 and 4 which form the majority of duodenal perforations are best treated by simple closure.

The large ulcer with an abundance of scar tissue induration which encroaches upon the lumen of the duodenum and which usually is adherent to neighboring organs, presents a different pathology and demands appropriate surgical therapy. Such lesions, prior to perforation, have produced a partial stenosis thereby resulting in a change in the motile and secretory functions of the stomach. The closure of these ulcers after perforation usually produces a real rather than an apparent obstruction. Consequently they present the cardinal indications for gastroenterostomy, namely, stenosis plus a preexisting altered gastric function. (Perhaps some form of pyloroplasty of the Finney or Horsley type may prove efficacious in the therapy of these types.) Furthermore, simple closure in this type seldom results in permanent cure, and the relapses after such a closure have helped to popularize primary gastroenterostomy for all types. The treatment of the multiple ulcer type must be governed by the pathological problem at hand.

From the above-mentioned pathology, it will be noted that for practical purposes perforated ulcers of the duodenum conform themselves to one of two types. First, the soft lesions, the more common type, characterized by (a) their relatively smaller size, (b) their superficial extent, (c) their failure to penetrate deeply prior to the embolic or thrombotic phenomenon which results in perforation, (d) the absence of dense induration, and (e) lack of adhesions and encroachment upon neighboring structures. Second, the calloused type, characterized by (a) their large size, (b) their deep penetration, (c) their dense induration, (d) their firm adhesions to neighboring structures, and (e) their tendency to produce mechanical complications. I believe that simple closure by inversion with fine chromicized catgut will cure the vast majority of the first group, whereas the calloused types require in addition a primary gastroenterostomy (or perhaps some form of pyloroplasty). The successes and failures in this series are in accord with these general principles.

## DIAGNOSIS

The diagnosis of perforation can be made easily in almost all cases. The anamnesis of previous indigestion, the suddenness of onset, the agonizing pain (constant in character in contradistinction to the colic-like pain of appendicitis, cholecystitis, intestinal obstruction or renal colic), the vast extent and the degree of rigidity and tenderness so soon after onset, the comparatively slow pulse, and the slight or no febrile reaction make a familiar picture. A few points are worthy of emphasis. Vomiting occurred in less than half of the cases in this series (12 cases). Rectal examination may elicit extreme tenderness soon after perforation, much earlier than in appendicitis. The symptom of shock has been overemphasized; in this series but 7 cases were in any degree of shock. Apparently shock, when present, occurs soon after perforation, and is transitory. It should also be mentioned that in stout individuals there is only moderate rigidity. Also in the transitional period passing on to true peritonitis, there is a free interval when the pain is ameliorated. One patient (case 3) seen eighteen hours after perforation sat up in bed exclaiming he felt quite well. No opiate had been administered. His abdominal cavity contained the usual amount of duodenal contents and the peritoneum was markedly injected. More than half the cases show obliteration of liver dullness, either partial or complete. It is merely a corroborative sign and is in no wise pathognomonic. The left shoulder pain, mentioned as occasionally occurring early after perforation, is probably a pneumogastric-spinal accessory reflex rather than pain of peritoneal or anginal origin.

In the preperforative irritation stage, physical examination may reveal acute tenderness over the ulcer with some rigidity of the overlying muscles. This connotes a deep ulcer with peritoneal irritation and should be an indication for surgical intervention. (Case 7 well illustrates this danger signal: The patient, a female aged

fifty-seven years, for six months had typical hunger pains occurring three hours after eating. Her examination elicited acute tenderness over the site of the pylorus and moderate rigidity of the rectus. Temperature, pulse and blood count were normal. She was put to bed and placed upon the Lenhartz diet. Tenderness and muscle spasm persisted. On the eleventh day of treatment, perforation occurred suddenly while she was at absolute rest.)

## TREATMENT OF ACUTE PERFORATIONS

The treatment of acute perforation is immediate operation regardless of any degree of shock that may be present—for the patient's condition rapidly improves with the relief of intraperitoneal tension. A 4 inch right mid-rectus incision is deepened down to the peritoneum. A point of practical importance is to determine the lower border of the liver. This should limit the upper angle of the incision. If a small nick be first made into the peritoneum a little free fluid will well up into the incision, and gas bubbles erupting through this will clinch the diagnosis of perforation. The escaped contents are best aspirated, especial attention being paid to Morrison's space, to the right lumbar gutter, and to the toilet of the pelvis. With moist pads the surrounding structures are gently pushed aside and the perforation is sought. Fibrin deposits are an excellent guide to the point of perforation and not infrequently gas bubbles point the way. If the perforation is obscure, slight pressure on the stomach may cause bubbles to appear. Closure of the perforation is accomplished by infolding the ulcer with fine chromicized catgut reinforced occasionally with an omental tab. The expediency of a primary gastrojejunostomy is determined by the conditions presenting. If simple closure is performed, one tests the patency of the lumen of the gut. If the tip of the little finger can be insinuated through the site of closure, there is little danger of obstruction. One then makes a search for secondary ulcers, gall-bladder and appendiceal disease.



The added risk of primary gastroenterostomy, before the advent of peritonitis, is slight in a patient whose condition during operation, as regards respiration, aeration and circulation, is good. The danger of working in a potentially infectious field is more theoretical than real. The real dangers are twofold: (1) a 2 to 3 per cent chance of future gastrojejunal ulcer formation and (2) the late secondary sequelae that occur in some cases despite perfect technique in the hands of the most skillful. Therefore, unless the condition is such as to demand a primary gastroenterostomy, viz., definite obstruction, simple closure should be performed. A good practical rule is, when in doubt, do not perform a gastroenterostomy. It can be performed later, if necessary.

If a careful peritoneal toilet be made by aspiration there is no need of drainage except of the abdominal wall. The suprapubic stab wound seldom drains, but may produce adhesions and it is contraindicated. Drainage to the site of closure is never instituted as several duodenal fistulae have resulted thereby. The slow perforations with abscess formation are best treated by simple incision and drainage. If a fistula ensues, a secondary closure with gastroenterostomy is indicated.

Following operation the patient is placed in a semi-recumbent position, given one or two doses of morphine and a 5 per cent glucose rectal drip. Small amounts of water by mouth are permitted after four hours. On the third day, Lenhart's diet is instituted and adhered to for its entire course. At this time, the foot of the bed is kept elevated about 6 inches. Frequently small amounts of alkalis are administered the first two weeks. The patient is then given a light, selected, nonbulky diet with crackers and milk between meals for the next two weeks. At the end of the month a roentgenologic examination is made. The patient is warned of the dangers of dietary indiscretions and receives medical supervision for at least six months.

#### REPORT OF TWENTY-SEVEN CASES

This series is of consecutive cases oper-

ated upon between October, 1912 and October, 1926. There were 25 males and 2 females; the youngest patient was aged twenty-one years, the oldest fifty-seven years; the average age was thirty-five years. It is interesting to note that no patient was obese (contrast the gall-bladder type) and that several had been under rather severe mental or physical strain for some period of time. Their occupations were varied, no one predominating.

Seventeen patients, 63 per cent, gave a typical previous ulcer history varying from a few months to eleven years. Eight, 30 per cent, presented an indefinite history of dyspepsia. In 2 cases there were no symptoms up to the moment of perforation. (In these the evidences of inflammation and repair were absent and the picture was one of focal necrosis.)

But 2 cases gave a history of melena, none of hematemesis. In only 3 cases perforation occurred within the first year of symptoms and the average duration of symptoms until perforation was almost four years.

Of the 27 perforations, 24 were acute and 3 slow perforations. Of the slow perforations one presented a large abscess extending from the liver to the iliac crest. This was of two weeks' duration. Another case slowly perforated, the infection apparently remained localized for a week and then ruptured, producing a diffuse peritonitis. In the third case the rupture was into the lesser sac presenting the clinical picture of duct obstruction with jaundice.

In conclusion one seems justified in emphasizing the importance of reporting the end-results of the treatment of perforated ulcers of the stomach and of the duodenum as separate entities. The immediate results depend chiefly upon the time that has elapsed after perforation. Only by careful follow-up records extending over long periods can reliable statistics be obtained as to ultimate cures. Undoubtedly the duodenum is capable of complete restitution to normal even though apparent or mild degree of real stenosis obtains after closure. The end-results of

simple closure in this series are much superior to those treated in which gastrojejunostomy was performed. A fuller appreciation of the pathological problem presented in each case should result in more rational methods of treatment. To state dogmatically that all cases treated by simple closure will result in permanent cure is as illogical as to insist upon a primary gastrojejunostomy as a universal procedure.

### Discussion

DR. JOHN H. GARLOCK: Dr. Dineen has asked me to present the figures of the cases of perforated ulcer on the Second Surgical Division of the New York Hospital. These include a number of private patients of Dr. Pool, as well as the cases from his service.

The total number of cases is 110. There were 25 deaths, a mortality of 22 per cent. There were 66 cases in which operation was performed within six hours of the perforation. In this group, the mortality was 4 per cent. In the cases coming to the hospital 22 hours or more after perforation, the mortality was 85 per cent.

There were 10 cases of simple closure plus primary gastroenterostomy; 1 case of pyloroplasty; 99 cases of simple closure of the perforation. Nine cases subsequently required gastroenterostomy.

The follow-up shows the following: Of 85 patients discharged, 77 were followed. Of these, 61 were rated "good," which means freedom from symptoms and restoration to their former occupation. Sixteen were marked "poor." Of the 61 "good," 55 had simple closure (79 per cent); 5 had closure plus gastroenterostomy (7.2 per cent); 1 had pyloroplasty. Of the 16 marked "poor," 14 had simple closure. Of these, 9 had a secondary gastroenterostomy, and are now well. In addition to the 14 cases, 2 had simple suture with primary gastroenterostomy.

This series of cases represents a group cumulative since 1914.

DR. THOMAS H. RUSSELL: Coming from Philadelphia, where I had been taught by Dr. Deaver, to New York, as I did some years ago, I naturally did gastroenterostomy in addition to suturing the perforation in perforated duodenal ulcer and the cases did well. The first Horsley operation that I did some years ago was in a case of a perforated duodenal ulcer.

The man made an excellent recovery, but the following December, after having operated on him in February, he developed a subphrenic abscess which I drained through the old wound and he again made a splendid recovery. I have used the Horsley excision in several cases of perforated duodenal ulcer instead of doing a gastroenterostomy. I have not done gastroenterostomy in a perforated duodenal ulcer for many years.

DR. ABRAHAM O. WILENSKY: Dr. Brenner's paper is an elaboration and confirmation of viewpoints which I expressed about five years ago and published in *Annals of Surgery*. In that conception acute perforations occur either as primary embolic phenomena, in which event they resemble appendix perforations; or as similar phenomena in the base of established ulcers. Sometimes during operation one can distinguish between the two but usually the pathology is obscure.

As regards treatment, the lesions in the first of these two varieties regularly undergo healing after simple closure and recovery is not followed by subsequent symptoms. Operations upon the patients in the second group are very frequently followed by the classical symptoms of ulcer; indeed, in many of these the post-operative symptoms are simple continuations of the preoperative ones. Under the circumstances it seems better to do a simple closure of the perforation during the emergency. One can always reopen the abdomen, should there be sufficient indication to do so, and then carry out the procedures which seem best at a time when conditions are not complicated by the dangers of an acute perforative lesion. If one follows the plan of doing maximum operations during the time of the acute emergency one will do unnecessary manipulations and undergo unnecessary risks in a large proportion of the cases.

### GASTRIC SECRETION AFTER SUBTOTAL GASTRECTOMY\*

EUGENE KLEIN, M.D.

(Author's Abstract)

Hydrochloric acid is one of the important factors in the production of peptic ulcers. The good results after partial gastrectomy

\* From the Surgical Service of Dr. A. A. Berg, and from the Pathological Laboratory, Mount Sinai Hospital, New York.

have been ascribed to the production of an acidity. Lewisohn has reported that 77 per cent of the cases show no free acid after partial gastrectomy. Others have had similar results. The thought naturally occurs that it would be of value to ascertain why the remaining 23 per cent were not rendered anacid. In addition some gastrojejunal ulcers have recently been reported after this operation. It would be interesting to discover whether these occurred in the group in which the acidity had persisted. To study these questions a more careful analysis of the acid conditions was made after every partial gastrectomy. In place of the Ewald test meal which had previously been used, fractional (Rehfuß) test meals were made over a period of three hours.

A consideration of the physiology of the stomach shows that the operation of partial gastrectomy removes only one of the phases of gastric secretion.

The primary or psychic phase is due to impulses that reach the stomach over the vagi and are initiated chiefly by the tasting and chewing of food. This response varies in different individuals and also in the same individual at different times. It is directly proportional to the amount of appetite.

The secondary phase follows on the contact of the gastric mucosa with certain food and chemical substances, the most important being the products of protein digestion. Since the primary phase which initiates gastric digestion lasts about two hours, sufficient acid and ferment are secreted to digest some of the food present and therefore furnish these protein products. The acid and peptic cells are located in the body and fundus of the stomach. There are none in the antrum. Nevertheless stimulation of the body and fundus by the presence of protein products *does not* cause gastric secretion. Similar stimulation of the antrum *does*. The site, therefore, for the secondary stimulus is the antrum. This is the part of the stomach removed in partial gastrectomy.

The intestinal phase of gastric secretion

starts one to two hours after the entrance of food into the intestine. Its relative importance in man is not yet determined.

In addition to these there is the so-called continuous secretion. It is probable that the gastric glands are always active. But while in the majority of individuals the secretion, except following the above stimuli, is small, in others it may be very large. Although a continued secretion with a high acidity in a stomach that contains no food may be pathological, it is often found in apparently normal individuals. It may be that those with the so-called ulcer diathesis fall within this group, since this condition is very common in duodenal ulcer. The origin of this secretion is unknown. It may be due to an exaggerated vagus tone.

The amount of acid secreted in different people varies since the stimuli exerted by these different phases are not of the same potency for all. Normal individuals thus fall into hyposecretory, isosecretory and hypersecretory groups, the largest being the middle or isosecretory group.

Partial gastrectomy removes the antrum and hence the secondary phase. This is ordinarily the most important. It therefore reduces quantitatively the amount of acid secreted. The remainder is neutralized wholly or in part by the food, saliva, bile and pancreatic juice. Whether it will be completely neutralized depends on the potency of the other phases in the particular individual. If, for instance, there is a very high and prolonged continuous secretion due to a markedly exaggerated vagus tone, antrectomy will only reduce the acidity. But where these phases are not overactive, antrectomy will produce a hypoacidity or an acidity.

The table shows the maximum acidity in the Rehfuß test meals immediately after (recent), and six months after (old) partial gastrectomy. These are compared to preoperative findings. In the group of duodenal ulcers there is a moderate immediate and a marked late reduction. In the gastric ulcers there is a marked diminu-

tion in acidity both immediately and six months later. The same is true of the group of gastrojejunal ulcers, although the number of postoperative cases is still small. A high continuous secretion is common in duodenal ulcer. It is rare in gastric ulcer. It may be that this accounts for the higher acidity left in the duodenal group. The cause for the further reduction after six months cannot be given. Possibly this is due to a lowering of the vagus tone.

While partial gastrectomy apparently does not produce an anacidity in as large a percentage of cases as previously believed, it nevertheless accomplishes a far greater reduction than gastroenterostomy. Gastroenterostomy produces no quantitative diminution of acid secretion. It must hope to neutralize all of the acid secreted from all of the phases and it rarely succeeds.

MAXIMUM FREE ACID AFTER PARTIAL GASTRECTOMY  
IN FRACTIONAL TEST MEALS

		Ana- cidity per cent	0-20 per cent	20-50 per cent	50+ per cent	Num- ber of cases
Duodenal.....	Unoperated		4	36	60	50
	Recent	9	9	46	36	11
	Old	25	41	17	17	12
Gastric.....	Unoperated		28	60	12	50
	Recent	45	33	11	11	9
	Old	100				3
Gastrojejunal	Unoperated		11	67	22	9
	Recent	25	25	50		4
	Old	50		50		2

Recent refers to cases examined about three weeks after operation.

Old refers to cases examined about six months after operation.

Unoperated in the gastrojejunal group refers to cases examined before the partial gastrectomy.

That the amount of acid reduction actually achieved by partial gastrectomy is significant is shown by the few recurrences reported after the operation. Where gastrojejunal ulcers do follow, it is probably due to the fact that a sufficient lowering of acidity was not effected because of the reasons mentioned above. Whatever acid did remain was sufficient in combination with the other causative factors of ulcer to produce a recurrence.

### Discussion

DR. A. A. BERG: I think the work Dr. Klein has presented is of very great importance in

relation to the whole subject of gastric and duodenal ulcer. We know very little about the physiology of gastric secretion. It has a tremendous bearing on what to do to cure gastric and duodenal ulcers. Dr. Klein has proven that there are three kinds of curves of gastric secretion: 1, a hyposecretion; 2, a normal curve; and 3, a hypersecretion. It is hard to understand the way in which these three curves are brought about, where the stimulation for gastric secretion comes from, what the connection with the vagus nerves is, what is the exciting factor, and to what point excitation is carried before gastric secretion begins. In spite of the intensive experimental work that has been done in connection with the physiology of gastric secretion we still are very far from determining what the various exciting factors of gastric secretion are, along what channels they act, and what their relation to gastric ulcer is. We do know, clinically, that where there is no acid there is no ulcer, in spite of statements that ulcers can form in an anacid medium. In all our cases, and we have had many, we have still to find a single instance in which ulcer has existed in stomach or duodenum without acidity. If we can make a stomach anacid, we can say that in such a stomach an ulcer will not form.

I was very much interested in the New York Hospital statistics that 65 per cent of perforated ulcers are cured after simple closure of the perforation. Following our cases since 1914 we find we have not been so fortunate as to the permanency of cure after simple closure or closure combined with gastroenterostomy. It all hangs on the acid factor; without that the infective factor plays a very small rôle. All our attempts have been to reduce or minimize the amount of acid after operation. How successful we have been can be judged only by our results. When we have made a patient hypoacid we have as yet to find a single recurrence. Our trouble has come when a patient is hyperacid.

Another factor Dr. Klein has brought out is the bearing of anacidity on pernicious anemia. We have heard from authoritative sources the dire consequences of anacidity in producing pernicious anemia. How true that is I do not know, but in our 500 cases we have still to see a single case of pernicious anemia following subtotal gastrectomy, with anacidity.

I cannot lay enough stress upon the value of this work of Dr. Klein's on acid secretion. I am sure that he will continue these investiga-

tions and hope that he will some time find the center of acid secretion. Perhaps it will be on the lesser curvature somewhere near the re-entrant angle of the stomach and that all the stimulus passes toward that acid center and is reflected to the glands. Eight years after subtotal gastrectomy the acid cells are still just as normal as in an unopened stomach. Should we be able to control this acid factor we will be able to do away with recurrent gastric and duodenal ulcers and gastroenterostomy will then be a thing of the past.

DR. A. LIGHTSTONE: My investigations on dogs have shown that the acid cells are in the pylorus. A French investigator reports he has found acid cells in the pylorus. These facts, and the work of Dr. Klein, seem to bear out the contention that the secretion of the pylorus is acid and not alkaline as is stated in the text books.

## PRESENTATION OF CASES

### PERFORATED DUODENAL ULCER SIMULATING COMMON DUCT STONE

EDWARD C. BRENNER, M.D.

This patient was referred to me by Dr. Arthur F. Chace on April 29, 1926, with the diagnosis of calculus common duct obstruction.

She is fifty-nine years of age, and has had 5 children, the last twenty-three years ago.

The past history is immaterial except that for ten years she has been troubled with flatulency, mostly in the evenings.

Six weeks ago she had a sudden acute attack of epigastric pain, without radiation or vomiting, lasting one hour. Four weeks ago, a similar attack requiring morphine. For the past three weeks she has had daily attacks of epigastric and right upper quadrant colic, been nauseated but did not vomit. For two and a half weeks has become progressively more jaundiced.

Examination. Flabby and obese, and markedly jaundiced. Tenderness and indefinite sense of mass in right upper quadrant. No rigidity. Temperature 100° F., pulse 88. Respirations 20. White blood cells, 11,000, polymorphonuclears 77 per cent. Coagulation time seven minutes. Stools showed no digestion of fats.

Preoperative Diagnosis. Stone in common duct.

Operation at N. Y. Post-Graduate Hospital,

May 1st. Gall bladder normal, liver moderately enlarged and congested. On passing finger into foramen of Winslow several ounces of creamy pus escaped from lesser sac. This was aspirated with sucker through the gastrohepatic omentum. An indurated ulcer about 2 cm. in diameter with a 4 mm. perforation in its crater presented on the posterointernal surface of the first portion of the duodenum. This was closed by inversion. The dilated common duct was surrounded by inflammatory material. The lesser sac was drained through the gastrohepatic omentum and a posterior gastrojejunostomy was performed. Convalescence uneventful. On the sixth day stools became normal in color and in about six weeks the jaundice entirely disappeared.

The points of interest in this case are:

1. The history and clinical picture simulating common duct stone.
2. The unusual site of the ulcer.
3. Abscess of the lesser sac causing complete biliary obstruction.
4. The problem of surgical procedure in such a case. It was felt that common duct drainage was not necessary because the obstruction was an inflammatory condition and with its subsidence duct patency would return.

(No discussion)

### GASTROJEJUNOCOLIC FISTULA

EDWARD C. BRENNER, M.D.

On February 22, 1920, this patient was operated upon at Lincoln Hospital for perforated duodenal ulcer and cholelithiasis. His ulcer history extended over a period of about three years, the gall-bladder symptoms for about six months, during which time he had two very severe attacks of colic.

The findings at operation were: A contracted gall bladder containing a moderate number of small calculi, and an indurated ulcer, 2 cm. in diameter, on the superior surface of the first part of the duodenum. There was a small perforation in its crater, the escaping contents being small in amount and well localized under the liver.

Operation consisted of closure of ulcer by inversion, posterior gastrojejunostomy, cholecystectomy and appendectomy. One cigarette drain to Morrison's space. Convalescence uneventful. For four and one-half years the patient remained well except for constipation and flatulency.

In July, 1924, he was suddenly seized with acute epigastric pain which radiated to the left inguinal region, was nauseated and at once had a copious diarrheal movement which he stated contained much of the previously ingested lunch. Ever since he has had diarrheal movements, twenty to thirty minutes after eating and stools contain parts of the previous meal. Movements have been ten to twenty each day and patient has lost 44 pounds.

The preoperative diagnosis of gastrojejuno-colic fistula was confirmed at operation which was performed at the N. Y. Post-Graduate Hospital on December 1, 1924.

**Operative Findings.** Moderate adhesions about scar. Duodenum appeared perfectly normal. At site of gastrojejunostomy a fistulous communication with the transverse colon, the opening being about 1 cm. The colon, stomach and jejunum were separated and the gastric and colonic atria closed. Due to the ragged condition of the jejunum three inches were resected and a side-to-side anastomosis performed with difficulty. Time of operation fifty-three minutes. Convalescence uneventful. Patient was reading a tabloid newspaper the next day. Discharged on the sixteenth day. Gained about 30 pounds the first month. He has remained well.

The points of interest in this case are:

1. Four and one-half year period before developing the fistula.
2. Absence of symptoms of marginal ulcer up to time of perforation.
3. Complete restitution to normal of a previously badly damaged and stenosed duodenum.

(No discussion)

#### PERFORATED DUODENAL ULCER. DEHISCENCE OF WOUND

J. WILLIAM HINTON, M.D.

H. R., admitted to Bellevue Hospital June 9, 1927; discharged July 28, 1927.

The patient had had frequent attacks of pain in the upper abdomen with vomiting, at least once every year for four years. The pain was worse with each attack. Last attack came on suddenly fifteen hours before admission with sharp pain in mid-epigastrium which doubled patient up and caused him to vomit dark red material several times.

**Examination.** Thin, emaciated, middle-aged male, very acutely ill. The abdomen showed general board-like rigidity. Tenderness—general, most marked in epigastrium.

**Preoperative Diagnosis.** Perforated duodenal ulcer.

**Operation.** Abdomen opened through upper right rectus—splitting incision. On opening peritoneum gas and free fluid escaped. Duodenum delivered. Perforation found about 0.5 cm. in diameter. The ulcer was excised by the Horsley technique. Wound sutured transversely with No. 1 chromicized catgut, one layer of sutures being used. Abdomen cleansed by suction and closed in layers without drainage, No. 2 plain catgut for the peritoneum; No. 2 chromicized catgut for muscles and fascia, silkworm-gut for retention sutures; and silk for the skin.

On the eighth day there was partial separation of the skin with serous fluid saturating the dressing. Patient apparently had separation of the wound. Was taken to operating room immediately.

**Second Operation.** Complete separation of the peritoneum was found, although the skin incision had separated only for approximately one-third of the wound. Peritoneal edges freed, sutured with No. 2 chromicized catgut; muscles sutured with No. 2 chromicized catgut; fascia with No. 2 chromicized catgut; silkworm-gut retention sutures; skin not sutured.

June 22, 1926. Purulent infection of wound.

June 29, 1926. Infection of wound improving.

September 12, 1926. Patient free from symptoms. Abdominal incision firm.

March 6, 1927. Abdominal wound firm. Patient free from symptoms.

(No discussion)

#### PERFORATED DUODENAL ULCER. ACUTE APPENDICITIS TWO AND ONE-HALF YEARS POSTOPERATIVE

J. WILLIAM HINTON, M.D.

J. B. admitted to Bellevue Hospital October 5, 1924; discharged October 18, 1924.

**Present Illness.** Sudden onset of abdominal pain localized in upper abdomen followed by vomiting. Pain did not radiate. No history of previous attacks. For fifteen years has suffered from indigestion, nausea and dull pain in the epigastrium. Occasionally vomits. Constipated.

**Past History.** Irrelevant.

**Examination.** Poorly nourished and developed. Arteries markedly sclerosed. Abdomen board-like. Rigidity more marked in upper abdomen, with marked tenderness. Extremities

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negative. Urine contained faint trace of sugar and slight amount of albumin. Leucocytes 8600. Polymorphonuclears 70 per cent, transitionals 2 per cent, lymphocytes 28 per cent.

*Preoperative Diagnosis.* Perforated duodenal ulcer.

*Operation.* Abdomen opened through upper right rectus—splitting incision. On opening peritoneum gas and free fluid escaped. Duodenum delivered. Perforation found about 0.5 cm. in diameter. Ulcer excised by the Horsley technique. Wound sutured transversely with No. 1 chromicized catgut, one layer of sutures being used. Abdomen cleansed by suction and closed in layers without drainage. No. 2 plain catgut for the peritoneum, No. 2 chromicized catgut for muscles and fascia; silkworm-gut for retention sutures; silk for skin.

*Follow-up.* Patient feels well, no complaints, except occasional pain in region of wound especially in bad weather. Has been following diet. Scar firm.

Re-admitted February 22, 1927; discharged March 9, 1927.

*Present Illness.* For thirty-six hours pains in right abdomen in acute attacks. Vomited slightly four hours later.

*Examination.* Old rectus incision healed. Good result. No herniation. Tenderness in right lower quadrant and muscle spasm. No rigidity or tenderness elsewhere. Rectal examination shows right side tender. Urine negative.

*Blood Count.* Leucocytes 13,500. Polymorphonuclears 80 per cent, transitionals 20 per cent, lymphocytes 10 per cent.

*Preoperative Diagnosis.* Acute appendicitis.

*Operation.* Abdomen opened through a low right rectus—splitting incision. Cecum was found bound down. Appendix acutely inflamed, base perforation, with some free fluid. Appendectomy; stump carbolized, not inverted. Drain inserted to the cecum. Incision was extended upwards and the duodenum exposed. There were no adhesions and the omentum was entirely free. No evidence of remaining ulcer could be detected by palpation or inspection. Abdomen closed in layers as before.

(No discussion)

### PERFORATED DUODENAL ULCER. RECURRENCE OF SYMPTOMS WITHIN THREE MONTHS

J. WILLIAM HINTON, M.D.

V. F., admitted to Bellevue Hospital May 12, 1925; discharged June 9, 1925.

*Present Illness.* Complains of cramp-like intermittent pain in umbilical region, with nausea and vomiting and difficulty in respiration for twenty-four hours. No chills or urinary discomfort. Pain relieved by an enema. Three years ago had similar attack of pain for a few hours. Since that time has had numerous attacks of pain and distress in abdomen, with nausea and vomiting, which last a few hours.

*Examination.* Abdomen moderately rigid. Part of it seems to be voluntary. Moderate tenderness in right umbilical region. Rigidity more marked in right lower quadrant. No masses felt. Rectal palpation, definite tenderness above prostate, more marked in midline with tenderness on both sides. Leucocytes 17,600, polymorphonuclears 88 per cent, lymphocytes 12 per cent. Urine negative.

*Preoperative Diagnosis.* Acute appendicitis.

*Operation.* Abdomen opened through a right rectus—splitting incision. On opening abdomen free fluid not encountered. Appendix appeared normal; removed. Stump carbolized and inverted. Incision extended upward. Small amount of straw-colored fluid found in upper abdomen. First portion of duodenum had the omentum plastered over it with exudate around duodenum. On removing the omentum perforation about 2 mm. in diameter was found. Duodenum was mobilized and Horsley pyloroplasty performed, extending incision one inch on duodenum and one and one-half inch on stomach. Ulcer-bearing area excised, wound sutured transversely with No. 1 chromicized catgut, three sutures being taken for the closing. Omentum plastered over duodenum. Abdomen closed in layers without drainage.

*Follow-up.* September 6, 1925. Patient states that one month ago symptoms similar to those before operation returned with acute onset of pain.

October 4, 1925. Patient states that he is free from pain at present time. On diet, with alkali powders. Roentgenograms reveal a duodenal ulcer.

December 6, 1925. Patient states he was free from pain until four days ago when he began having pain just before meals.

January 3, 1926. Patient states he is much improved and has only occasional pain since his last visit. To continue on his diet.

April 11, 1926. Free from symptoms for the past two months. Is continuing diet.

March 7, 1927. Free from symptoms at the present time. Has had attacks of abdominal



pain, usually at night, lasting two hours in early hours of morning. Last pain one and a half month in duration. Advised to have operation if pain continued.

(No discussion)

## ANTECOLIC PÓLYA RESECTION OF THE STOMACH WITH ENTEROANASTOMOSIS

CHARLES L. GIBSON, M.D.

**CASE I.** F. H., aged forty-six years, admitted February 8, 1927 with gastric symptoms of long duration, and gnawing pain in epigastrium of three weeks' duration. The pain was quite severe, associated with meals, and relieved by soda bicarbonate. No nausea or vomiting. Had lost considerable weight since onset of illness.

Physical examination essentially negative. Fluoroscopic examination showed a large, long stomach, with a perforating walled-in niche on the lesser curvature with fixing adhesions. Ewald meal showed a free HCl content of 46 and total acids 71; no blood. Wassermann reaction, 4 plus. Urine and blood negative.

At operation the stomach was found to be large and low with an ulcer on the lesser curvature in the center of area of induration. Subtotal gastrectomy was done and the duodenum was closed. An antecolic Pólya-Mayo operation was also done with enteroanastomosis of the two loops of jejunum by a Murphy button.

Postoperative course absolutely smooth and uneventful, without distension, vomiting or discomfort. Patient discharged on the eighteenth day.

May 6. He continues to feel entirely well and has gained eleven pounds.

**CASE II.** P. M., aged 34 years, was admitted November 17, 1926 with epigastric pain of two years' duration. Pain came on two hours after meals and at night. It was relieved by eating and by bicarbonate of soda. In the last attack he vomited coffee-ground material. The illness was marked by remissions and increasing severity of attacks.

Physical examination was essentially negative. On the medical ward, the patient was found to have mild secondary anemia, and stool and vomitus contained much blood. There was no free HCl and the total acids were diminished in the stomach contents. Fluoroscopic examination showed an incisure of the greater curvature and an irregularity of the lesser curvature.

A diagnosis of ulcer was made but carcinoma could not be ruled out.

At operation, on the lesser curvature at the junction of the lower two-fifths with the upper three-fifths was an indurated ulcer evidently perforating into the gastrohepatic omentum. It was about the size of the last phalanx of one's thumb. There was no evidence of metastases or nodes and it was resectable; but in view of the possibility of carcinoma it was deemed wisest not to do a sleeve resection.

Therefore, resection of somewhat more than the distal half of stomach by Pólya-Mayo procedure, antecolic and with an enteroanastomosis by small Murphy button, about 5 inches away from the anastomosis was made. Duodenal stump closed in three layers, mucous membrane separately. A fourth row attached it to the capsule of the pancreas.

Pathological report showed gastric ulcer and gastric arteriosclerosis. Convalescence was uneventful and the patient was discharged on the twentieth day. He now "feels fine," and has gained 15 pounds.

**CASE III.** M. W., aged thirty-nine years, was admitted March 10, 1927, complaining of pain in the midepigastrium of two weeks' duration and gastric symptoms for many years. He was greatly emaciated. Fluoroscopic examination at the Cornell Clinic showed a duodenal ulcer with almost complete obstruction. There was somewhat lowered acid content by Ewald meal test.

At operation an ulcer was found on the duodenal side of the pylorus. Just as the stomach was lifted the ulcer perforated and a small amount of material came out. An antecolic Pólya resection was done, the line of section going through the stomach at about the junction of its distal thirds. An enteroanastomosis of the afferent and efferent loops was made with Murphy button.

Postoperative course was entirely uneventful until the seventh day when the patient had a sudden attack of severe abdominal pain, board-like rigidity and extreme tenderness. Diagnosis of perforation was made. At reoperation it was found that the Murphy button had cut through without any union so that in each loop there was a large hole. These were sutured with catgut. The Murphy button was felt inside the gut in the pelvis.

Following this the patient made a rapid recovery and was discharged the fifteenth day

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after second operation. Today he is in excellent condition and has gained 20 pounds.

## Discussion

DR. RICHARD LEWISOHN: I have not been successful with the antecolic anastomosis; my mortality rate has been very great with this procedure. With retrocolic anastomosis, however, my results have been very good. Having seen Dr. Gibson's good results, I may be tempted to try the antecolic Pólya operation again.

## INJURY TO THE COMMON BILE DUCT WITH REPAIR

THOMAS H. RUSSELL, M.D.

CASE 1. Mrs. N. B., aged fifty-six years, consulted me June 1, 1924, because of pain in the upper abdomen, worse in the right upper quadrant and referred to the right shoulder blade. The pain was colicky in character, radiated to the back and the shoulder blade, appeared one-half hour after meals, and lasted from two to three hours. It was always bad in the early hours of the evening. She was nauseated most of the time and felt bloated with gas. Constipation was very troublesome. No history of severe pain requiring a hypodermic injection, nor jaundice. Pain was much worse and continuous for the preceding three days. The appendix had been removed four years before for acute appendicitis.

Physical examination was negative except for general tenderness of the upper abdomen, a palpable, tender mass in the right upper quadrant, and some rigidity of the right rectus muscle. The patient was emaciated and appeared to have lost weight recently. Urine examination was normal, blood pressure was not recorded. On June 5, 1924 she was admitted to the Post-Graduate Hospital with the diagnosis of noncalculous cholecystitis.

On June 6 the gall bladder was removed in a routine manner from below upwards. The operation was performed by me without difficulty, in fact it appeared exceptionally free from difficulty. The gall bladder was distended, its walls markedly thickened and there was considerable edema about the lower end extending into the cystic duct. There were no stones. A cigarette drain was inserted to the foramen of Winslow and the wound was closed. Pathological examination confirmed my macroscopic findings.

The patient did exceptionally well for two days, but at the beginning of the third day, she became nauseated and very restless, the abdomen became somewhat distended, and gastric lavage and enemas gave little or no relief.

On June 9, three days postoperative, the sclerae began to show the presence of jaundice, the urine contained bile, and there was a clay-colored stool after a cathartic. The next day all these symptoms were more marked.

Blood examination then showed:

Nonprotein nitrogen....	15.0
Uric acid.....	25.9
Urea nitrogen.....	12.6
Cholesterol.....	0.150
Chlorides.....	0.425
Icterus index.....	62.5

I felt sure that I had injured the common bile duct so Dr. Paul Klemperer and I examined the specimen which I had removed to determine if I had excised a piece of the common duct by angulating it from undue traction on the gall bladder in its removal. The specimen had been placed in formalin solution so this examination was not helpful.

The next day, June 11, I reopened the wound, under ether anesthesia. A good exposure was obtained by simply removing the sutures. There was no bleeding. The common duct was found without difficulty as the upper end of it was very much distended, and there was a ligature causing a constriction about the site of the junction of the cystic duct. This ligature was removed without difficulty. There was a discharge of a large quantity of bile and the lower end of the common duct which had also been caught in the same ligature receded for about  $\frac{1}{2}$  inch. I found that I had excised about  $\frac{3}{8}$  inch of the common bile duct just where the cystic duct had joined it. The lower end was found to be patent as a small probe could be passed through into the duodenum. The duct was unusually small.

I found that I could easily approximate the ends of the divided duct so decided to do an end-to-end anastomosis over a small rubber tube.

Sutures of No. 1 chromicized catgut were used, about 6 interrupted stitches, to bring the ends together. They were not tied until the end of a very small rubber catheter had been introduced into the lower end of the duct to a point just within the duodenum; the upper end

of the catheter was then cut off leaving a piece about 2 inches long; the upper end of this short piece was introduced into the upper end of the duct and then the sutures were tied, approximating the divided ends of the duct and at the same time burying the tube within it. A catgut suture was placed through the duct and tube to hold the latter in place. A cigarette drain was inserted to the point of the anastomosis and the wound was closed in the usual way.

Two days later there was considerable bile on the abdominal dressing but this lasted only two days, when the cigarette drain was removed and there was no further bile drainage.

The patient asked to be allowed to sit up on June 17, which was but six days after the second operation, and due to a misunderstanding on the part of an over-enthusiastic nurse she was allowed up in a chair. She felt so much better that she was allowed to get up daily. The stitches were removed on the twelfth postoperative day and the patient was discharged thoroughly healed on June 30th, nineteen days after the second operation. She has continued well except for some trouble which she has had with a frontal sinus, up to the present time. Roentgen-ray examination of this patient's abdomen on June 24, 1925 showed that the tube had been passed.

This patient never had known that a tube had been buried in her common bile duct, but her son was given a full description of what was done.

I show this case, first, to demonstrate that this accident may happen in even what appears to be a very simple cholecystectomy from applying too much traction on the gall bladder, thereby angulating the common duct and clamping it instead of the distal end of the cystic and, second, to demonstrate that injury to the common bile duct during cholecystectomy can be diagnosed early and with considerable ease and, third, to demonstrate that a good result can sometimes be obtained by means of burying a tube in the common duct, as has been described.

CASE II. Miss E. C., aged thirty years, I saw on March 16, 1925 with the doctor who had operated upon her. He stated that he had performed cholecystectomy for cholecystitis four days before, and on the third day postoperative he noticed slight jaundice in the sclerae and the patient did not seem to be altogether as well

as the average case of cholecystectomy should be three days after operation.

At the time of the first examination there was perceptible jaundice present, with bile in the urine and none in the feces. The abdomen was somewhat distended, there was nausea and general restlessness. I made a diagnosis of common duct obstruction and suggested that the common duct may have been injured at the time of operation. The doctor explained that while the operation seemed unusually simple in every way he, too, felt sure that there was some occlusion of the common duct.

The next day I assisted him in reopening the wound and looking for the cause of trouble. We found that about  $\frac{1}{2}$  inch of the common bile duct at the site of entrance of the cystic duct had been excised, and the two ends of the duct had been ligated in the same ligature. This ligature was released and there was a gush of bile from the upper end of the duct. The bile was aspirated from the abdominal cavity and a probe was introduced through the lower end of the duct into the duodenum. Several interrupted No. 1 chromicized catgut sutures were inserted into each end of the partially excised duct, but not tied until a part of a small rubber catheter was placed in the upper and lower end of the duct. The lower end of the catheter was introduced through the duct just into the duodenum, the sutures were then tied approximating the two ends of the duct and burying the piece of rubber tube in the common duct. A cigarette drain was inserted to the site of anastomosis and the wound was closed. The patient made a splendid recovery, even though bile drained from the abdominal wound for some days.

Three months later, roentgen-ray examination showed the tube still in the common duct. She continued well until the following November, eight months after the operation, when she began to feel nauseated, lost her appetite, and had clay-colored stools, the urine contained a large amount of bile and there was itching of the skin with perceptible jaundice. She was given cathartic salts in warm water before breakfast each morning and improved very much, but the symptoms recurred at intervals of two to three weeks until another roentgenogram January 8, 1926, showed that the tube had been passed through the intestinal tract.

At this time I thought that this patient had a stricture of the common bile duct at the site

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of the anastomosis, so I advised her to go into the Post-Graduate Hospital where we could make the necessary tests to be sure of the diagnosis. Just at that time the symptoms began to subside so that the icterus index and indirect VandenBurgh tests were practically normal. In a few days the patient felt well again and was discharged. Five days later the jaundice, intense itching of the skin, nausea and vomiting reappeared so she was readmitted to the hospital. At this time the urine was deeply colored with bile, the icterus index was 44.1, the indirect VandenBurgh test showed 5.6 grams to 100 c.c. of blood. Dr. John Erdmann was called in consultation, and he advised further conservative treatment. The patient remained in the hospital until February 11, 1926, when she felt much better and left.

On June 2, 1926 she was readmitted. She stated that since leaving on February 11 she had had five attacks of jaundice associated with clay colored stools, dark urine, pruritus, each attack lasting from a week to ten days; but the jaundice had never entirely disappeared. At this time the icterus index was 11.5, white blood cells 10,800, red blood cells, 3,848,000, hemoglobin 10 per cent, and the urine showed a marked trace of bile.

On June 11, 1926, I reoperated upon this patient and found at the site of the anastomosis a stricture of the common duct which was about  $\frac{1}{4}$  inch long and through which I could not introduce a very small probe. I attempted to mobilize the duodenum, suture it to the liver and introduce the end of the common bile duct above the stricture into a new opening into the duodenum, thus doing away with the distal end of the bile duct; but I was unable to make a satisfactory mobilization of the duodenum on account of adhesions so this procedure was abandoned. I divided the stricture longitudinally and again introduced a tube into the common duct just as was done in the former operation, except that the lower end of the tube did not extend into the duodenum. This tube was sutured into the duct with one silk stitch, care being taken to pass the suture through the wall of the tube and not into its lumen. The patient made an uneventful recovery and was discharged from the hospital seventeen days later.

The patient remained well until about six weeks ago when she began to show symptoms again of common duct obstruction. Another

roentgenogram, made only a few weeks ago, showed the tube still in the common duct.

I then referred this patient to Dr. Howard Shattuck for medical treatment. He thinks that there is an occasional plugging of the tube, but since he has been treating her she has gained weight, is very comfortable and continues her work as a teacher.

## Discussion

DR. EDWARD C. BRENNER: I should like to know Dr. Russell's opinion regarding the outcome of the case in which the catheter was twice introduced into the common duct.

DR. RUSSELL (closing): I do not know what the outcome in this case will be. She is already having trouble.

ABSENCE OF THE GENITAL ORGANS  
IN A GIRL

THOMAS H. RUSSELL, M.D.

L. A., aged twelve years, was admitted January 31, 1927, for a hernia on the left side.

*Present Illness.* While swimming in July, 1926 she felt something give way, and her mother noticed a lump in the left inguinal region. A physician prescribed a truss, which was worn for some time, but recently the girl had been having severe attacks of pain in the groin.

*Family History.* Father and mother alive and well. No chronic illness in the family.

*Past History.* Was treated in the Post-Graduate Hospital two years ago for curvature of the spine and club feet.

*Physical Examination.* Some deformity of the feet. There is a mass in the left inguinal region the size of a thumb, which is freely movable, and appears to be in a hernial sac. There is an impulse from coughing and exertion. The clinical picture is that seen in an undescended testicle in a male.

*Operation* February 2, 1927. Usual incision for left inguinal hernia disclosed a distinct hernial sac containing a mass the size of a small thimble projecting from the external oblique and reflected upwards on the external oblique muscle. The external oblique muscle was divided and the sac was found to emerge from the internal inguinal ring. Sac opened. The contained organ had all the appearances of a normal testicle with a very small vas extending retroperitoneally into the pelvis. I introduced my finger into the pelvis for exploration and

could not feel any uterus or tubes, so I reflected the inner margin of the skin to the inner side after elongating the incision and made an additional opening into the abdominal cavity through the rectus muscle to enable a more thorough abdominal exploration.

I found complete absence of uterus, and appendages. The bladder rested immediately against the rectum.

In each side of the true pelvis, there was a retroperitoneal mass, the size of a normal kidney—unquestionably the kidneys. There were no signs of the kidneys in the usual location for those organs.

With the left hand in the pelvis, a Kelly forceps was introduced from without, into what appeared to be the vagina, but the end of this forceps passed immediately into the bladder. A more careful examination revealed complete absence of vagina and clitoris.

The appendix, which was fastened by adhesions to the pelvic brim on the right side, was liberated and removed. The second abdominal wound was closed. The hernial sac was resected and the organ returned to the pelvic cavity. Wound closed.

The pathological examination revealed an acute appendicitis of moderate grade.

When I explained the condition found at operation to the mother she told me that she had had the child operated upon principally because of the abdominal pain which she thought was due to the rupture, but which I think was due to the appendix, and also because she thought it might stop the child from the habit of masturbating which had become very noticeable.

I had Dr. James N. West of the gynecological department at the Post-Graduate Hospital make an examination with me before discharge from the hospital to determine whether anything could be done with the idea of constructing a vagina. He concurred in the correctness of the diagnosis of absence of the vagina and advised against any operation for constructing a vagina.

The patient was discharged from the hospital eleven days after the operation.

(No discussion)

## MAJOR THORACOPLASTY FOR CHRONIC EMPYEMA. TWO CASES

JOHN H. GARLOCK, M.D.

CASE I. E. K., male, aged twenty-four years, was first admitted to the Second Medical

Division of the New York Hospital on May 3, 1925, with a lobar pneumonia, involving the right lower lobe. This was followed by an empyema which, upon aspiration, cultured streptococcus hemolyticus. The patient was transferred to the Second Surgical Division, service of Dr. Pool, and on May 16, 1925, under local anesthesia, a portion of the ninth rib posteriorly was excised. About two quarts of fairly thick pus were aspirated. Two rubber tube drains were inserted and the cavity was later dakinized. The patient did well, and was discharged to the country July 1, 1925, with a small wound draining a small amount of purulent fluid.

He was readmitted July 13, 1925 with the history that while in the country he had fever and increased discharge from the sinus. Roentgenograms at this time showed a thickened pleura with a collapsed lung. There was no evidence of encapsulated fluid. On two occasions, the sinus was enlarged. It was evident that there was a large empyema cavity. As the patient was in rather poor condition, he was given two transfusions and discharged October 4, 1925, to the country. It was recommended that after his general condition had improved, he was to return for obliteration of the cavity.

He was readmitted May 6, 1926 with the history that he had remained in the country for one month and then had returned to light work. It was noted that for the past six weeks there was evidently a communication between the pleural cavity and a bronchus. The cavity had a capacity of 16 ounces. The man's general condition was fair. He had lost considerable weight and presented the picture usually associated with moderate chronic sepsis. It was decided to obliterate the empyema cavity by a graded operation, using essentially the method described by Keller of Washington.<sup>1</sup>

The first stage was performed May 11, 1926, under ethylene anesthesia. The cavity was found to extend from the dome of the diaphragm to the second interspace and from the posterior axillary line to the vertebral column. It was lined by a thick, hard, greyish-green membrane. The ninth and tenth ribs were excised, the point of division of each rib being one inch outside the lateral limits of the cavity. The muscles were cut between clamps

<sup>1</sup> Keller, W. L. The treatment of chronic empyema where the recognized surgical procedures have failed to produce obliteration. *Ann. Surg.*, 1922, lxxvi, 549; 700.

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and preserved. Parietal pleura was excised and the skin flaps sutured to the pleura over the divided muscles. The wound was then carefully dakinized.

On May 22, 1926, under ethylene anesthesia, the second stage was performed. The eighth and seventh ribs were excised, the same procedure being used as in the first stage. The cavity was again treated by the Carrel-Dakin technique.

On June 8, 1926, the third stage was done. The skin flaps were dissected. The muscles were

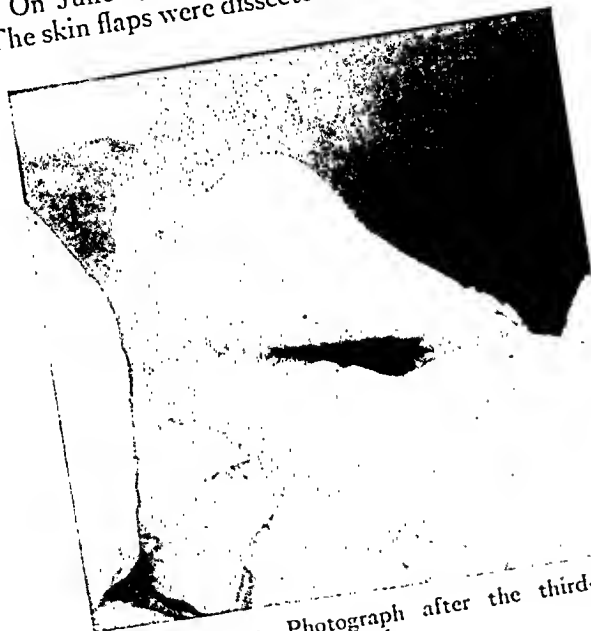


FIG. 1. Case 1. Photograph after the third-stage operation.

divided. The scapula was pulled forward, and the fifth and sixth ribs were excised. The skin was then sutured to the pleura, preserving the muscles. The wound was again dakinized.

On June 24, 1926, the fourth stage was done, repeating the same procedure, and excising the third and fourth ribs. At the upper end of the cavity was found a pleurobronchial fistula, measuring 2 cm. in diameter, apparently corresponding to the cparterial bronchus. Following this, the wound was again treated by the Carrel-Dakin method.

On July 6, and again on July 7, the entire cavity was packed with gauze, saturated with 2 per cent alcoholic solution of gentian violet. This is supposed to aid materially in removing the superficial layers of the pleura. The wound was then dakinized and on successive dressings it was seen that the superficial layers of the visceral pleura peeled off.

On July 17, 1926, the bronchial fistula was closed by a method used originally by Dr. Pool in a case of bronchial fistula following a lung abscess. This case was presented at the New York Surgical Society and is reported in *Annals of Surgery*, March, 1927. The skin flap on the outer side of the wound was dissected free, and the rhomboideus minor muscle was isolated. The edges of the bronchial fistula were freshened with a curette, and the pedunculated muscle flap was placed into the fistula, so as to plug the bronchus. It was sutured to the rim of the opening with interrupted chromicized catgut stitches. The visceral pleura was then subjected to dissection, after the method of Ransohoff. The wound was packed and the patient was kept under the influence of sedatives, to prevent any subsequent cough. The fistula remained closed and the muscle united by practically primary union. The wound was later dakinized and during this process, the visceral pleura was removed piecemeal. After obtaining 6 successive negative cultures, the cavity was closed on September 1, 1926. In the meantime, the lung had expanded considerably. This closure operation was performed in the following manner: The skin flaps were well mobilized. The surface of the lung was everted lightly. The anterior segments of the fifth, sixth, and seventh ribs had regenerated for a distance of one and one-half inches; these were excised. The various muscle flaps were mobilized and sutured together, across the cavity. These muscles included the trapezius, serratus magnus, levatores of the scapula, and part of the latissimus dorsi. To favor agglutination to the pleura, considerable counter pressure was used. Two long rubber tube drains were placed between the muscle planes. These were removed in forty-eight hours. The wound healed by primary union and the patient was discharged from the hospital eighteen days later. Since then, he has gained 30 pounds in weight, has returned to his former occupation, and has no symptoms referable to his cardiorespiratory system.

This case is presented, first, to call attention again to the graded type of operation for chronic empyema in patients who are in poor condition, and who are unable to withstand a major procedure in one stage. With the graded operation, the margin of safety is considerably increased with a consequent marked diminution in mortality rate. Second, the case illus-



trates the use of a pedicle muscle flap in the closure of bronchial fistulae.

CASE II. R. A., male, aged nineteen years, has been ill almost continuously since the age of three, when he had pneumonia. Following his pneumonia, he was confined in various tuberculosis sanatoria over a period of nine years. The diagnosis of tuberculosis, however, was never made. Three years ago, his condition was diagnosed as bronchiectasis, and a pneumothorax was induced without much benefit. Four

The lad was sent to the country with a discharging sinus.

The wound healed, but reopened after ten days, and discharged a considerable amount of pus. While in the country, he gained 12 pounds. He was readmitted to the hospital October 27, 1926. The cavity was then carefully dakinized. On December 11th the wound was enlarged and it was found that the eighth rib had regenerated considerably, forming a thick bony plate. This was excised, and the cavity was then again dakinized. There was no appre-

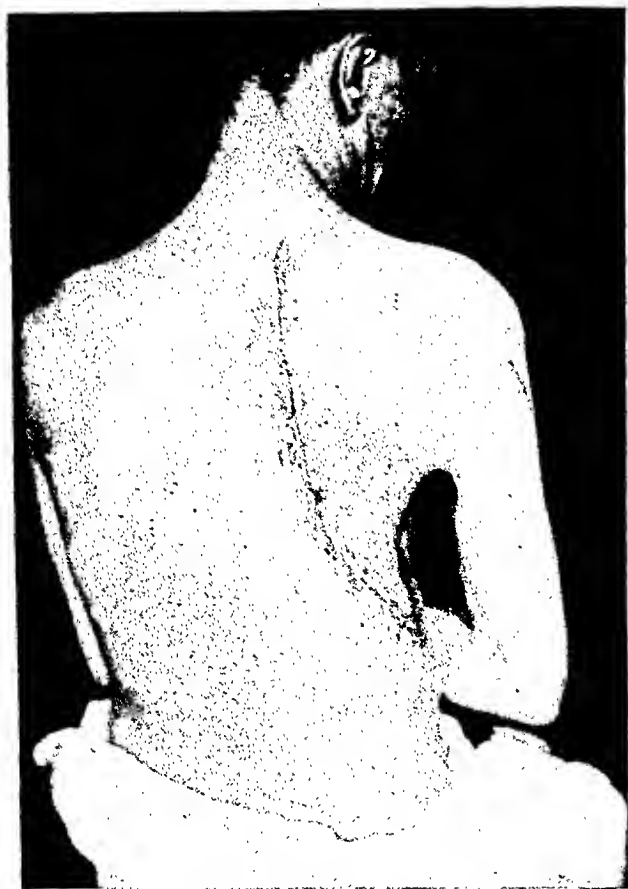


FIG. 2. Case 1. Photograph after final operation.

months ago, he had a left lower lobar pneumonia which was followed by empyema. This remained untreated until the day of his admission, August 24, 1926, to the Second Surgical Division of the New York Hospital. Roentgenograms at that time showed an extensive empyema cavity in the left chest. On the following day the patient was operated on and a segment of the eighth rib was resected. About 300 c.c. of greenish-yellow pus was evacuated. This cultured pneumococcus, group iv. Following the operation, convalescence was slow, and a chronic empyema cavity seemed inevitable.



FIG. 3. Case II. Showing clearly the extent of the empyema cavity, the turned-in skin flaps and the criss-cross Ransohoff dissection of the visceral pleura. This is now ready for closure.

ciable decrease in size, following this procedure. It was then decided to perform thoracoplasty. The first stage was executed December 20, 1926. The patient at this time was not in very good condition, and a graded operation seemed definitely indicated. The eighth and seventh ribs were excised, so that their cut ends lay about one inch outside the lateral limits of the cavity. The divided muscles were placed beneath the skin flaps which were sutured to the parietal pleura. The wound was then dakinized.



On January 13, 1927, the second stage was performed, repeating the above procedure. The fifth and sixth ribs were excised. The cavity, whose capacity measured eighteen ounces, extended mesially as far as the vertebral column, and laterally to the posterior axillary line. On January 24, 1927, the patient was transfused.

On February 5, 1927, the third stage was performed. Seven inches of the fourth and third ribs were excised. The muscles were preserved beneath the skin flaps which were sutured to the parietal pleura. On the same day, another transfusion was given. The upper limit of the cavity had been reached at this stage.

The next step in the procedure involved the removal of the visceral pleura. On two successive days, the cavity was packed with gauze saturated with 2 per cent alcoholic solution of gentian violet. Following this, the cavity was dakinized and the superficial layers of the pleura, which was remarkably thickened, peeled off. On March 8th, an attempt was made to decorticate the lung. A definite cleavage plane could not be found, therefore a Ransohoff discission was performed. On successive dressings, the small squares of pleura produced by this discission were excised. This resulted in considerable expansion of the lung, but it was evident that there was fibrosis extending into the lung parenchyma.

About three weeks ago, a small bronchial fistula appeared over the center of the visceral pleura. This was treated by applications of gentian violet, and it is now practically healed.

At the present time, the empyema cavity is wide open, there is considerable expansion of the lung, and the final stage, plastic closure, will be undertaken as soon as six successive negative cultures are obtained.

This case is presented to show a patient with chronic empyema in the process of having his cavity obliterated, and to indicate graphically the method used.

(No discussion)

### COLIC INTUSSUSCEPTION

EDWARD D. TRUESDELL, M.D.

A boy, aged seven years, was admitted to St. Mary's Free Hospital for Children November 19, 1926. He had been sick four days. During the first two days he had what appeared to be a respiratory infection. For this he was given large doses of a proprietary cough remedy.

During the two days preceding admission to the hospital his condition was aggravated by the onset of severe abdominal pain, vomiting and bloody stools. At the time of admission he presented a rigid abdomen with an indefinite mass in the left upper quadrant. There was also elevation of temperature with high leucocyte count.

Under ether anesthesia a mass was felt in the left upper abdomen, having the characteristics of an intussusception. Upon opening the abdomen an excessive quantity of watery exudate, having a colon bacillus odor, was encountered. The intussusception was found to be composed entirely of large intestine, the transverse colon and the adjoining portion of the ascending colon having entered the descending colon. The intussusception was expressed with considerable difficulty, particularly the final portion, the procedure requiring two enlargements of the incision. Upon the expression of the intussusception it was found that practically the entire length of the large intestine possessed a definite mesentery which had predisposed toward the development of the intussusception.

The first two days of the convalescence were stormy, the patient having an exceedingly high temperature, rapid pulse, cough and congestion of the lungs. Thereafter the convalescence progressed uneventfully.

The points of particular interest are the occurrence in a boy seven years of age, of an intussusception of the colic type, the presence of a mesentery to the ascending and descending colons and the presence of a peritoneal exudate presenting a colon bacillus culture, which resolved without evidences of peritonitis, localized abscess, or other interperitoneal complication.

(No discussion)

### DEMONSTRATION of INSTRUMENTS

APPARATUS FOR DIRECT BLOOD  
TRANSFUSION DEVELOPED  
BY DR. R. W. THAYER

MARIUS GREENE, M.D.

This apparatus is intended for use not by specially trained blood transfusion personnel, but by the average surgeon and practitioner under circumstances where sterility is obtain-

able with difficulty, and when there is lack of skillful assistance.

The apparatus provides for constant lubrication of syringe piston from above as well as from below, eliminating the danger of sticking of the piston. A provision for 5 c.c. of sterile solution above the piston prevents the entrance of the slightest amount of air into the syringe from above. The apparatus provides for the administration of blood mixed with saline solution, saline solution alone, or blood alone, at will. It provides for washing out of the syringe at will without disconnecting the instrument. It provides for renewal of saline solution after such washing of the syringe. All parts are standard, therefore easily obtainable. The lumen of the syringe is larger than that of the average syringe. Any type of needle can be used, and any type of rubber connection, such as silk rubber connections, paraffine-covered rubber, etc.

Because the syringe is in constant lubrication during the entire procedure of blood transfusion and may be washed out with a sterile solution at will, eliminating the necessity of spraying ether upon the syringe to prevent clotting of blood and sticking of the piston, this instrument possesses a marked advantage over similar instruments now in use. The volume of a negative suction is so balanced by means of proper weight of the instrument itself that the unpleasant accidents resulting in fainting of the donor due to too extensive suction are overcome.

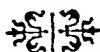
The construction of the apparatus is extremely simple. It consists of 20 c.c. Record syringe, placed in a tubular frame, which has provision on the bottom to fit a three-way valve, which in turn is attached to the pedestal. A saline solution cup, fastened to the pedestal, is removable. The Record syringe is held in position by a washer, which at the same time

serves as a container for sterile solution to be used for the lubrication of the syringe above the piston. The washer is fixed in position by a screw cap. The whole apparatus can be assembled in less than a minute. Its weight is  $4\frac{1}{2}$  pounds.



FIG. 1.

To operate it, all that is necessary is to rotate the tubular frame, with the syringe in it, from one opening of the valve to the other, at the same time aspirating and emptying the syringe. The entire procedure can be performed with one hand, leaving the surgeon's other hand free. The instrument is a one-man direct blood transfusion apparatus.



## BOOK REVIEWS

ANATOMICAL, PHYLOGENETICAL AND CLINICAL STUDIES ON THE CENTRAL NERVOUS SYSTEM. By B. Brouwer, Professor of Clinical Neurology, University of Amsterdam. 8vo. Cloth. \$2.50. Pp. 67; 16 figs. Balt., Williams & Wilkins Co., 1927.

This little volume contains the three Herter Lectures for 1926, delivered at the Johns Hopkins Hospital by Professor Brouwer.

In the first lecture, on "the projection of the retina of the brain," Brouwer gives an outline of his very interesting researches on the course of the fibers from various parts of the retina to the crossed and uncrossed geniculate body in rabbits, cats and monkeys. Minute lesions of the retina were made and the secondary degenerations in the optic nerves, chiasm, optic tracts, and geniculate bodies were studied in serial sections stained by the Marchi method. The author's views on the location of the pathways for monocular and binocular vision are of great interest. In each geniculate body a small part of the ventral border of the periphery con-

tains the fibers for monocular vision, while the greatest portion serves for binocular vision,—the upper half of the retina being represented mesially and the lower half laterally. The macular fibers lie in a localized area. Brouwer is therefore in accord with Henschen as against von Monakow.

The second lecture deals with the organization of sensibility in the nervous system and the results of investigations concerning the development of pathways for various forms of sensation in the evolutionary scale. In this lecture Brouwer made some remarks on the value of lipiodol injections for the diagnosis of tumors of the spinal cord.

The significance of phylogenetic studies for the neurologist is the main topic of the third lecture.

The three lectures, although very short, are very instructive and stimulating, and an evidence of the important researches in comparative anatomy and physiology carried out by the Holland school.—C. A. ELSBERG.



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# PROGRESS IN SURGERY

*Selections from Recent Literature*

EVANS, ARTHUR, and CADE, STANFORD, London. Cancer of the tongue: Preliminary report on radium treatment. *Brit. J. Surg.*, July, 1927, xv, 55.

The treatment of 17 cases of cancer of the tongue is reviewed. In each case the diagnosis was confirmed by histological examination.

In 16 of these cases the primary growth in the tongue completely disappeared after treatment. The technique is described.

No claim is made as to permanence of results; the after-history of the patients alone can decide this.

The paramount difficulty is the treatment of the glandular area. A combination of surgical excision and radium therapy appears to be the most satisfactory method.

DANDY, WALTER E., Baltimore. Glossopharyngeal neuralgia (tic douloureux). Its diagnosis and treatment. *Arch. Surg.*, August, 1927, xv, 198.

Glossopharyngeal neuralgia is a type of tic douloureux exactly like trigeminal neuralgia. Its clinical picture (pain at the base of the tongue and throat on swallowing or talking or in spontaneous attacks) is so characteristic and the attacks so vivid that the diagnosis is easy and unmistakable.

Two cases are reported and appended to eighteen others assembled from the literature. The clinical features are analyzed and tabulated.

The treatment is purely surgical. An operation by which the ninth nerve is sectioned intracranially was carried out in both cases. The superiority of this operation over section of the glossopharyngeal nerve in the neck is due to the fact that other nerves are not injured and the nerve is cut above the ganglion, thereby precluding return of the malady. The operation is practically without danger to life and leaves no subjective or objective disturbance in its wake.

HEITGER, JOSEPH D., Louisville, Ky. Relation of inflammation of maxillary sinus to that of nose and other paranasal sinuses. *Southern M. J.*, August, 1927, xx, 618.

The maxillary antrum is the most frequently involved of all the nasal sinuses.

Polypi in the meati bear the same relation to chronic catarrhal disease of the sinuses emptying therein as the presence of pus in these areas to suppurative sinus disease.

Secondary or recurring polypi are more frequently encountered than the primary type.

Recurring polypi with negative results from antrum puncture may indicate chronic catarrhal inflammation of the antrum. Recurring polypi are the objective symptom of chronic catarrhal inflammation of the accessory sinuses and suggest involvement of the antrum or other nasal sinuses. The most frequent point of origin of recurring polypi lies in the antrum and not, as was formerly considered, in the ethmoid.

Polypi are present in the ethmoid capsule, because the pathway from the antrum leads past the ethmoid.

ROUX-BERGER, J. L., Paris. Removal of the cervical glands in cancer of the tongue. (*Le curage des ganglions du cou dans le cancer de la langue.*) *Presse Méd.*, July 13, 1927, lvi, 881.

The author lays special stress upon the necessity of removing the carotid glands in cancer of the tongue. In performing a block dissection of the neck he proceeds in the following manner. An incision is made along the anterior border of the sternomastoid from the mastoid process to the clavicle. Another incision at right angles to this is made beginning at the point of the jaw. The two flaps formed in this way are dissected back. The cervical fascia is incised in the midline and along the ramus of the jaw. Beginning at the bottom, the attachment of the sternomastoid is severed, the internal jugular is doubly ligated and divided and the mass of tissue is reflected upwards. The submaxillary region is now evacuated. The tissue mass now is suspended only at its upper angle by the sternomastoid. This is then severed, with care to avoid the branches of the facial nerve. The author insists upon the necessity of block removal including the internal jugular vein. Where the tip of the tongue is involved, this procedure must be carried out on both sides. Where the lateral

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aspect of the tongue is affected, only the same side must be so removed. If, however, in such a case there are enlarged glands upon the opposite side, simple excision of the glands will suffice because of the frequency with which such glands are merely inflammatory enlargements.

KOPP, J. G., Amsterdam. Bloody discharge from the nipple. (*Les écoulements sanguins du mamelon.*) *Acta Chir. Scandinav.*, July 28, 1927, lxii, 115.

A hundred and eighty-one patients with breast cancer were found to have a bleeding nipple in twenty cases (11 per cent). In one-fifth of them the discharge was present before the formation of tumor or was the only symptom. In nine of the cases (45 per cent) a cancerous degeneration of a benign tumor was very probable.

Of the forty-five patients with benign tumor of the breast twenty-two had a bleeding discharge. In sixteen cases no tumor was clinically distinguishable, although a duct papilloma or cystic breasts were found, which have a great inclination towards malignant degeneration. Cessation of the bleeding discharge is not a proof of recovery.

The only treatment of all cases of bleeding nipple, even without existence of a tumor, is partial or total removal of the breast. Partial extirpation will not be sufficient in some cases and is therefore seldom advised. Radiotherapy is most uncertain and is not advisable.

SINGER, R., Vienna. The first operative treatment of angina pectoris by anterior ramisection of the  $C_8$  to  $D_3$  roots. (*Die erste operative Behandlung der Angina pectoris durch Ramicotomia anterior  $C_8$ - $D_3$* ). *Wien. klin. Wchnschr.*, Aug. 4, 1927, xl, 989.

The author calls attention to the fact that in the routine resection of the stellate ganglion in the treatment of angina pectoris, many motor as well as sensory fibers have been cut. Extensive animal experimentation showed that this procedure was entirely unnecessary and even in many cases harmful. The sensory fibers of one side of the heart were through the stellate ganglion of the same side to the rami communicantes of the  $C_8$ - $D_3$  nerves. By actual operation on patients suffering from angina pectoris, Singer believes the existence of the same relationships in the human has been shown. The operation may be done under local anesthesia but is best performed under general

narco-sis. An incision is made along the posterior border of the sternomastoid muscle. The fascia covering the vertebral muscles is exposed. On it the cervical chain is found and traced down to its enlargement in the stellate ganglion. At this point the ganglion is found lying directly over the first dorsal costovertebral joint. The ramus communicans between the ganglion and the first intercostal nerve identifies the  $D_1$  ramus communicans. The other rami are found lying parallel either above or below. One case is reported in which this operation was performed with satisfaction though only one side was operated upon. Six months after left-sided ramisection, the left-sided pains had completely disappeared and there were gradually diminishing attacks of pain only upon the right side. In the course of the next several months these too had gradually become less and less frequent.

GRAHAM, EVARTS A., St. Louis. The treatment of pulmonary suppuration. *Ann. Surg.*, August, 1927, lxxxvi, 174.

Complete rest in bed is of the greatest importance in acute pulmonary abscess. It is often astonishing to see the marked improvement in a case of chronic pulmonary suppuration after the correction of suppuration in the nasal sinuses. Many of those cases associated with spirochetal infections become healed merely by the administration of an intensive course of treatment with neosalvarsan. Such cases are much more frequent than was supposed. During the last year 74 per cent of Graham's cases were found to be associated with large numbers of fusiform bacilli or spirochetes in the sputum. Not all of them, however, will respond to neosalvarsan. Many cases initiated by the aspiration of a foreign body will recover promptly after its removal, but again not all.

Drainage may be improved by posture and by the bronchoscope. But too much reliance should not be placed upon this instrument as a therapeutic agent except for removal of foreign bodies. Despite the claims often made for the therapeutic value of this instrument there have been published practically no statistics giving results of treatment. The type of case in which the bronchoscope is most effective is the type situated at the root of the lung, in which the largest percentage of spontaneous recoveries occurs. Finally drainage may be increased by surgical interference. From an experience based on 329 cases of

pulmonary suppuration, exclusive of empyema and tuberculosis, Singer and Graham feel that the indications for surgical drainage are impelling only in those cases in which the abscess is situated near the periphery of the lung, in those cases in which spontaneous drainage through the trachea has become shut off with a resultant extension of the inflammatory process, and in certain chronic refractory cases. The mortality will be less if surgical drainage is not undertaken too early. It is extremely dangerous to go through a large edematous portion of lung in order to reach the abscess. If the abscess has ruptured into the pleural space, often drainage of the empyema will be the only surgical interference necessary.

Compression of the diseased tissue is a very effective means of obliterating cavities and it also may make the drainage more efficient especially if the abscess is near the hilum. The simplest method of inducing compression is by artificial pneumothorax, the best results of which are obtained in subacute abscesses not located at the periphery of the lung. In the latter cases there is danger of rupturing into the pleural cavity. Artificial pneumothorax must be continued for at least several weeks and sometimes for several months. Other methods of producing compression, e.g., extrapleural thoracoplasty or paralyzing the diaphragm on the affected side by avulsion of the phrenic nerve, should be reserved for relatively chronic cases.

In certain chronic refractory cases it seems desirable to remove some of the diseased tissue. For this, safer than lobectomy is Graham's procedure of cautery pneumonectomy and the modified lobectomy of Whittemore. A series of 45 cases in which the operation of cautery pneumonectomy has been carried out is discussed in which it is shown that in 31 cases, there is freedom from symptoms.

LILIENTHAL, HOWARD, New York. Mechanical principles of the operative treatment of pulmonary tuberculosis. *Ann. Surg.*, August, 1927, lxxxvi, 182.

Rest and drainage are the two important mechanical objects of the surgery of pulmonary phthisis. Rest may be temporary and in varying degrees, or it may be permanent in varying degrees even to the complete abolishment of lung function.

There are extrathoracic methods. Those relating to the phrenic nerve are described.

Operations upon the thorax itself deal with rest and with forms of drainage, either by way of the air passages and mouth or out into the world.

The obliteration of pulmonary cavities or of diseased areas of the pleural sac are described. Speaking broadly, this obliteration is a form of drainage.

Pulmonary collapse and compression are aided by the suction power of negative intrapleural pneumatic tension. This negative pressure cannot operate when there is an air passage through the chest wall. It cannot operate in the case of large intrapulmonary cavities which directly open into the normal outside air through a large bronchus.

Methods of operation are described and mechanical principles on which they are founded are discussed.

YATES, JOHN LAWRENCE, Milwaukee. Operations as aids in the treatment of pleuropulmonary tuberculosis. *Ann. Surg.*, August, 1927, lxxxvi, 200.

The basic obligation of treatment, which is to promote healing of pleuropulmonary lesions with the least cicatrization, is attainable by improving the quality and increasing the quantity of blood delivered to affected lungs and restricting their excursions, by altering intrathoracic tension, and by destroying irreparably diseased structures.

This obligation can be fulfilled whether the disease be incipient or advanced by combining non-operative measures (rest, diet, fresh air, sunshine, and drugs) with operative measures (transfusions of unmodified blood, intravenous administration of salt and glucose solutions, induced palsy of the diaphragm, resection of parietes, and partial or complete lobectomy with cautery).

HOLLOWAY, JOHN W., SCHLUETER, SIMON A., and CUTLER, ELLIOT C., Cleveland. The relation of immunity to the experimental production of abscess of the lung. *Ann. Surg.*, August, 1927, lxxxvi, 165.

The authors' dog experiments indicate that the older the thrombus from which an embolus arises, and therefore presumably the more attenuated the organisms within it, the greater the liability to a minor and less disturbing pulmonary complication. To produce abscess we must have on the one hand organisms present of such virulence as to continue growth;

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and on the other an immunity insufficient to kill off the organisms when they reach the lung and yet sufficient to wall them off into a localized lesion.

TRUESDALE, PHILEMON E., Fall River, Mass.  
The thoraco-peritoneal operation for hernia of the diaphragm. *Ann. Surg.*, August, 1927. lxxxvi, 238.

Although the stomach and small intestines may pass through the opening in the diaphragm with the transverse colon, when constriction occurs the seat of obstruction almost invariably is in the transverse colon. The preliminary operation of appendicostomy or cecostomy promptly relieves the obstruction. If the diagnosis of diaphragmatic hernia has been established, this minor operation eliminates the necessity of laparotomy and allows adequate time to prepare the patient for the major operation of repair. In addition, it provides a safety valve in case of recurrence or during convalescence when pressure against the reconstructed diaphragm from distended gut below can be reduced to a minimum. The use of the stomach tube before and after operation is also of great value, especially in those cases which involve the stomach alone.

The first steps of the thoracoperitoneal operation should be conducted on the assumption that it will not be necessary to open the peritoneal cavity. In most cases a liberal exposure of the diaphragm through the chest wall will permit a complete reduction of the hernia and closure of the orifice without difficulty. In any case it requires no more time to provide a large window in the thoracic wall. This is done by employing the lapel incision. Beginning at the lower edge of the sixth rib in the posterior axillary line, the skin is divided in a downward direction over the seventh and eighth ribs, where it makes a right angle turn and follows the eighth intercostal space in a forward direction until it reaches the cartilaginous portion where it turns upward, again crossing the seventh and eighth ribs, thus outlining a trap-door. The skin is not dissected off the parietal wall. Returning to the point of beginning the incision is carried through all layers of the chest wall including the pleura. The seventh and eighth ribs are severed in the path of the knife which follows the line of the original skin incision. The flap is thus completed and turned upward on its base. When it is deemed necessary to expose the underside of

the diaphragm the vertical incision near the left border of the sternum is continued downward through the left rectus muscle for about 6 cm. to 8 cm. Incising the peritoneum, the diaphragm is then exposed above and below in such a manner as to permit the separation of all adhesions directly under the eye. The sac, if there is one, can be removed readily and its contents replaced below, thus permitting a speedy closure of the aperture. It may be considered of advantage to split the diaphragm from its anterior edge down to the hernial orifice. This gives the appearance of a somewhat radical step, but it permits a better access to the ring and facilitates its closure, with a running suture of chromicized catgut. This line is supported by mattress sutures of the same material. The peritoneal wall is then closed. The thoracic flap is then turned back in its place and closed tight with interrupted sutures of silkworm gut.

STETTEN, DEWITT, New York. Ballooning of the left lower abdominal quadrant as an early sign in perforated duodenal ulcer. (With observations on the characteristic spread of rigidity in acute abdominal lesions.) *Am. J. M. Sc.*, August, 1927, clxxiv, 208.

A definite ballooning of the left lower abdominal quadrant has been noted in a case of perforated duodenal ulcer. It is believed that this symptom is an early sign of an acute perforative lesion in the right hypochondrium which is usually a perforation of an ulcer of the duodenum, and that it is produced by the contraction of the right upper, right lower and left upper abdominal quadrants, which have become invaded and rigid, in the order named, while the left lower quadrant is still uninvolved and relaxed. It is important that the significance of this sign and the mechanism of its development be recognized to avoid making the erroneous diagnosis of a volvulus in the left lower abdomen, which it strongly suggests.

Analogous but contrasting progression and distribution of the rigidity and sensitiveness can be observed in other acute abdominal perforations with spreading peritonitis, notably in acute perforative appendicitis with progressive peritonitis.

KITTINGER, ALOIS. Vienna. The treatment of purulent peritonitis with filtrates of cultures of *B. coli* and other bacteria. (Antivirus.) (*Die behandlung der eitrigen Peritonitis mit*



keimfreien Koli- und Mischkulturfiltraten, Antivirus.) *Wien. klin. Wchnschr.*, Aug. 4, 1927, xl, 997.

Following the work of Besredka, the author attempted to influence the course of purulent peritonitis by means of the intraperitoneal injection of Besredka's antivirus. The reports are on 26 cases of peritonitis due to gangrenous or perforated appendicitis. The appendix was removed in the usual manner, the peritoneal cavity washed and 50 c.c. to 150 c.c. of antivirus injected into the pelvic basin. The abdomen was then closed without drainage. A dressing saturated with the antivirus was applied. All of the cases made an uneventful recovery, though some of the patients were of advanced age. In addition, the author calls attention to the marked relief of pain experienced by those patients in whom the antivirus was used as compared with those in whom it was not used.

SCHLEUSZNER, A., Bamberg. Ether treatment of perforation peritonitis. (*Behandlung der Perforationsperitonitis mit Aether.*) *München. med. Wchnschr.*, July 1, 1927, lxxiv, 1091.

The author has used ether in the treatment of peritonitis resulting from perforation. He has compared a series in which ether was used with another series in which it was not used. Of 113 cases treated with ether 12 died. Of another series of 79 cases in which no ether was used but in which the other procedures were exactly the same, 20 died. This decrease in the mortality occurred regardless of the cause of the peritonitis. In the one case, the mortality due to appendicular perforations was reduced from 18.8 per cent to 7.7 per cent. In the other case, the deaths due to perforations from other causes from 50 per cent to 26.1 per cent.

Following operation the ether, never more than 100 c.c., is placed in the abdomen and the wound is closed with drainage. The use of drains is absolutely essential. The author believes that the good results of the use of ether are to be attributed to its bactericidal action, to its action in stimulating peristalsis and in its general tonic effect on the whole body.

ODELBERG, AXEL, Stockholm. Primary resection of the stomach in perforating gastric and duodenal ulcers. *Acta Chir. Scandinav.*, July 28, 1927, lxii, 159.

Odelberg gives an account of 20 cases of

primary resection in perforating gastric and duodenal ulcers. He considers himself justified in drawing the conclusion that to advocates of the methods of resection in the surgical treatment of peptic ulcers, such methods can also be made to include the *early* cases of perforation.

ST. JOHN, FORDYCE B., New York. Results of the surgical treatment of carcinoma of the stomach. *Ann. Surg.*, August, 1927, lxxvi, 283.

X-ray examination of the stomach should be carried out wherever even a suspicion of carcinoma of the stomach arises, and in fact even when only unexplained loss of weight exists. Exploration is not contraindicated by an abdominal mass, and resection should be attempted, when metastases are not present, in cases presenting large local lesions, whenever such radical procedure is technically possible. Enlarged regional lymph-glands are not infrequently hyperplastic. The removal of a very extensive local growth may be followed by a brilliant result. Relative prognosis is difficult, despite gross and microscopic study of the specimen.

Of 32 cases in this series of cases of carcinoma of the stomach, where resection was carried out, five patients are alive and well after a period of five years.

MCWHORTER, GOLDER L., Chicago. Epidemic acute spastic colitis simulating acute appendicitis or intussusception; association with cervical adenitis and slight pharyngitis; probably one type of so-called intestinal influenza; a possible factor in epidemic appendicitis. *S. Clinics N. Am.*, June, 1927, vii, 507.

McWhorter has seen a number of cases of acute colitis largely of a spastic nature in which the symptoms resembled acute appendicitis and in one case simulated intussusception. Intestinal symptoms, especially diarrhea, are not unusual during epidemics of so-called influenza, and the simulation of a surgical lesion should always be borne in mind.

The history of an epidemic of influenza with intestinal symptoms is of considerable value. Occasionally in localities these epidemics occur with diarrhea, having no definite throat symptoms. They are particularly severe in large institutions. Abdominal pain is usually the first symptom noticed in the spastic colitis type and there is extreme soreness over the

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entire abdomen, but it tends to localize sometimes within a few hours to the right side, occasionally to the left. When there is a diarrhea at first the pains do not localize usually until constipation or spastic contraction of the colon develops. Soreness is the chief complaint and it is less marked when quiet and in the absence of food. It may persist for several days to two weeks. Usually in this type of acute spastic colitis one will find a slight redness of the pharynx or the tonsils and the cervical glands are definitely palpable and tender. Rarely do the patients complain of soreness of the throat or acute tonsillitis.

The temperature is usually normal or below at the onset, but may be  $100^{\circ}\text{F.}$ , rarely  $102^{\circ}\text{F.}$ , during the first or second day. Nausea or vomiting is rare, but may be present after eating or taking medicines. The appetite usually remains good throughout, but food is not tolerated well and increases the distress. The leucocytes usually vary from 8000 to 10,000 and the polymorphonuclears may be around 60 per cent. This is lower than would be expected in a surgical condition with an equal amount of tenderness. Usually there is extreme tenderness over a part or all of the colon. It has been noted more frequently localized over the ascending colon, but may change. The colon may sometimes be palpated and is exquisitely tender. It is felt to be contracted or somewhat edematous and seybala may be felt. There may be distention or the entire abdomen is too rigid for palpation. Muscle spasm is usually less marked and not limited to a small area. Usually the entire side is rigid. The stools may have been slightly loose for a few days before the onset of constipation with the minimal distress and general weakness. With the onset of constipation there may be no stools for several days. There is often a small hard fecal mass passed several times daily with some mucus or followed by some watery discharge. After a few days there may develop a mucopurulent slightly bloody discharge at the end of defecation, even when only one or two scanty constipated stools are passed during the day. The stools may have a foul or putrefactive odor. There is no relief following a movement, but often a marked weakness. Weakness almost to prostration is commonly present throughout. This is quite out of proportion to the other symptoms. The duration of the spastic colitis is from several days to two weeks, even in the absence of fever. It is

easily aggravated by cathartics or food. Frequently other members of the family have had an attack of diarrhea which is a more common epidemic type than the spastic colitis. There have been no cases where this colitis has become chronic.

Epidemics of acute appendicitis have been described. It has also been recognized that some cases of appendicitis have followed an acute throat infection.

MARKEY, OSCAR B., Cleveland, and KATO, KATSUJI, Los Angeles. Chronic intussusception. An unusual type with prolapse. *Am. J. Dis. Child.*, August, 1927, xxxiv, 249.

An unusual case of chronic intussusception with prolapse (prolapsed intussuscepti) is reported with clinical and post-mortem observations, and the condition is defined.

Such cases are frequently mentioned in the textbook, but the authors have encountered only seven case reports, most of which are inadequately described, and two of these were in adults.

Prolapsus intussuscepti usually occurs when the mesentery is abnormally long and free, and the usual factors in production of prolapsus take part.

In contrast with simple prolapse, the finger can be passed well up between the intussusceptient normal rectum and the prolapsed intussusceptum, at the same time that the sausage-like tumor can be felt in the left lower quadrant of the abdomen.

The chronicity and recurrence of the condition are explained by varying degrees or absence of intestinal obstruction. In the case reported here prolapse occurred only as long as the child was able to strain forcibly in his attempt to overcome the more or less complete, temporary obstruction of the bowel. After emaciation became pronounced, prolapse no longer occurred.

MILLER, EDWIN M., Chicago. Chronic duodenal ileus. *S. Clinics N. America*, June, 1927, vii, 643.

Chronic duodenal ileus may closely simulate lesions of the gall bladder and ulcers of the stomach or duodenum. The general build of the patient with his long narrow trunk and prominent lower abdomen may be highly suggestive, and the statement of the patient that his distress after meals is greatly relieved by lying down may seem an important bit of

evidence, yet it is only by the finding by means of the fluoroscope of a delayed emptying of the duodenum and a definitely abnormal dilatation of its lumen that a diagnosis can safely be made.

If the symptoms are mild it is possible that by careful attention to the diet, and the putting on of enough fat to increase the support for the abdominal viscera, the more radical measures may effectively be forestalled. In a well-defined case, however, in which a definite obstruction of the duodenum exists and gives rise to serious symptoms, nothing short of surgical relief will suffice.

VAN BEUREN, F. T., JR., and SMITH, BEVERLY C., New York. The status of enterostomy in the treatment of acute ileus. A statistical inquiry. *Arch. Surg.*, August, 1927, xv, 288.

The actual value of enterostomy as a treatment of acute ileus must be determined ultimately by statistical proof. Statistics published up to this time do not afford a satisfactory basis for comparison except in a few instances; those are too few for definite conclusions.

BROCKMAN, R. ST. LEGER, England. Toxemia of acute intestinal obstruction. *Lancet*, Aug. 13, 1927, ccxiii, 317.

It was thought probable on the basis of experiments on animals that the symptoms which develop in intestinal obstruction are due to some interference with physiological function, such as the absence of bile in the small intestine. For this reason bile was injected into the rectum in human cases of acute ileus.

The technique used in this series of cases was to commence with 2 oz. of human bile in 4 oz. of saline solution, repeated every four hours. There is no discomfort caused by using human bile and the patient does not experience any difficulty in retaining the injection. If, however, ox-bile is used, the desired effects are not obtained so easily, nor so quickly, and acute pain of a colicky nature appears, pain so severe as to call for morphia. Also at the end of half an hour or thereabouts the patients often declare that they are forced to return it. If human bile is now used for such a patient there is no further trouble, it is retained with ease and the desired results accrue more rapidly. The same pain was caused by the use of vomited bile in the only case in which it was employed.

The results of this treatment will follow in a case of unrelieved organic obstruction without any passage of feces or flatus. If the full remission of the toxemia and its accompanying symptoms is not obtained, the amount of the bile is increased by half an ounce at a time; the dilution remains in the same proportion.

In most cases after the first rectal injection of human bile the vomiting stops, and even if this is not the result at once it is very much diminished, and an increase in the bile given will secure the desired result. The violent hiccough which so often accompanies ileus, especially in cases of primary small intestine obstruction, will lessen and disappear in a few hours. The drawn, anxious expression fades rapidly. The dry furred tongue will become moist and clean, and will remain so in spite of an unrelieved organic obstruction. In addition, the restlessness is abolished. The patient will volunteer the information that he feels quite a different person from what he did a few hours before, and his whole manner and bearing confirm this statement as being true. Perhaps the most striking manifestation is the softening of the abdomen and the disappearance of the distension, without any passage of flatus per rectum. One is forced to the conclusion that it has gone whence it came and has been reabsorbed.

SUSMAN, M. P., London. Spontaneous rupture of the spleen. *Brit. J. Surg.*, 1927, xv, 47.

A case of spontaneous rupture of an apparently normal spleen in a man of 53 is recorded; only six similar cases could be found in the literature.

Of the seven cases, five had previous digestive symptoms; of these five, one had gallstones and another pulmonary tuberculosis and alcoholism; in the remaining three no cause of the digestive symptoms was found; possibly they were due to some splenic lesion, evidence of which was destroyed at the time of rupture.

Injury to the spleen may cause no immediately alarming symptoms, so that the association between an injury and subsequent rupture of the spleen is overlooked. Post-mortem specimens of healed spleens, and clinical cases of delayed rupture of the spleen, have been described to show that some cases of apparently spontaneous rupture are really traumatic.

ÉMILE-WEIL, P., and GRÉGOIRE, R., Paris. Operative indications in primitive splenomegalias. (*Indications opératoires dans les splénomégalias primitives.*) *Presse Méd.*, July 27, 1927, ix, 937.

Splenomegalias may be divided into two main types. The first is the so-called proliferative type in which are included the leukemias, the pseudoleukemias, Hodgkin's disease and sarcoma. In these cases operation is contraindicated. The second is the so-called inflammatory type, in which are included tuberculosis, syphilis, kala azar, malaria, bilharzia, leishmaniasis and echinococcus disease. This type also includes Banti's disease and the more specifically splenic diseases associated with hemolytic icterus, hemorrhages, anemia or increase in the red cells. Before undertaking splenectomy, a careful diagnosis based on a thorough study of the blood must be made. Operation is contraindicated where there is advanced disease of the liver associated with ascites. A case of the liver associated with ascites, a marked increase in the total number of red cells also contraindicates operation. Icterus, on the other hand, may be due to intrinsic disease of the spleen and does not in itself contraindicate operation though it may predispose to hemorrhage, etc. For the purpose of overcoming the dangers inherent on icterus, on anemia, as well as the tendency to hemorrhage characterized by long bleeding- or coagulation-time, non-retractibility of the clot, etc., the authors advise the use of transfusion. In the severe cases, this is carried out several times over a period of weeks preceding operation. In the milder cases one large transfusion may be sufficient but all cases get a transfusion of 200 c.c. of blood 1 hour immediately before operation.

NANTA, A., Algiers. Iodine in the treatment of splenomegaly. (*L'iode dans le traitement des splénomégalias.*) *Presse Méd.*, July 9, 1927, lv, 867.

The author calls attention to the fact that iodine is almost specific in its action on lymphatic tissues. The action of iodine in diseases of the spleen is well known among certain Russian and Italian writers. In fact some consider it of equal value with quinine in the treatment of malaria. Others have used iodine as a sclerogenic agent in the various other diseases of the spleen. The author has achieved a marked reduction in size of the spleen in a case of

myeloid leucemia. He recommends either oral or intravenous administration. Given orally, the author advises the use of a solution of 1 gm. of iodine and 2 gm. of potassium iodide in 10 gm. of water. Of this solution 5 drops are given every two hours. For intravenous use, the author prefers 1 c.c. to 5 c.c. of Lugol's solution diluted in 5 c.c. to 15 c.c. of water. The treatment must be carried on over a long period of time. He warns against the dangers of iodism and the increased tendency toward hemorrhage. The results, however, are so satisfactory as to counterbalance these inconveniences.

BARNETT, L. E., Dunedin, New Zealand. Recent advances in our knowledge of hydatid disease. Echinococcus cysts. *Surg., Gynec. & Obst.*, August, 1927, xlv, 148.

Hydatid disease, though rare in North America and Great Britain, is alarmingly prevalent in South America and is quite common in many other countries. The *tenia echinococcus* of the dog is the source of the cysts in man.

Barnett states that vast numbers of ova of the *tenia echinococcus* are passed from the bowels of an infected dog. A human being who fondles such a dog may get the ova on his hands and thus into his mouth, and Barnett believes that this is much the more common method of transmission than through eating of raw vegetable material contaminated by dog's excreta. The raw offal of sheep and cattle that may harbor cysts should not be fed to dogs. Barnett explains how the ova are carried in the blood stream into the liver and the lungs. The versatility of the scolex in the propagation of cysts as well as of the adult tapeworm is emphasized.

Not more than 50 per cent of hydatid cysts can be diagnosed by ordinary clinical methods, but the laboratory has provided two tests of extraordinary value, the Casoni skin reaction, and the complement fixation estimation whereby direct diagnosis can be raised to 80 or 90 per cent.

The rarity of hydatid thrill is explained. Exploratory puncture is condemned because of its many dangers.

Operative treatment by open incision, evacuation, and closure without drainage is coming to be recognized as the mode of election.

DE TARNOWSKY, GEORGE, Chicago. Primary echinococcus cyst of the kidney. *S. Clinics N. America*, June, 1927, vii, 783.

Because of the rarity of echinococcus cysts of the kidney, the diagnosis will be in doubt unless the mother cyst ruptures into the pelvis of the kidney and daughter cysts are expelled in the urine, or if—which is extremely rare—bimanual palpation of a kidney tumor gives the examiner the classical “thrill” produced by the rubbing together of daughter cysts.

The blood picture and serodiagnostic tests will be of the greatest assistance. Eosinophilia is present in 80 per cent of echinococcus cyst cases, the percentage of eosinophiles varying between 7 and 40 per cent. Unfortunately, eosinophilia is absent in cases where the cyst is dead, degenerated, or suppurative. It is frequently absent when the cyst has ruptured into the kidney pelvis, because in such cases the cyst content is eliminated with the urine without causing accentuated anaphylactic phenomena.

The complement-fixation test of Bordet-Gengou is positive in 93 per cent of echinococcus cases. The intradermal reaction of Casoni is positive in 90 per cent of all cases.

Puncture of a suspected echinococcus cyst of the kidney is a dangerous procedure. Not only may the escape of the liquid content into the perinephric tissues give rise to severe anaphylactic shock, but daughter cysts may also escape and proliferate de novo in the retroperitoneal tissues.

Marsupialization of the cyst or nephrectomy, if rupture into the kidney pelvis has occurred and the other kidney is normal, are the operations of choice.

O'CONNOR, VINCENT J., Chicago. Traumatic dislocation of the kidney. *S. Clinics N. America*, June, 1927, vii, 743.

Traumatic loosening of the kidney may be gradual, but it is more often due to a sudden rupture of its fascial and peritoneal coverings. Perirenal and periureteral hemorrhage occurs, and the resultant organization about these areas may result in sclerotic attachments which compress or angulate the ureter or renal pelvis. If low-grade infection supervenes in these areas of extravasation the subsequent density of these cicatrices will be increased, and as contraction occurs there will be a gradual compression of kidney, pelvis, or ureter. If the

kidney is not displaced and the trauma affects only the perirenal tissue a subsequent perirenal sclerosis may result.

DANHIEZ, [P., Lille. Large renal infarcts. (*Les grands infarctus rénaux*.) *J. d'Urol.*, June, 1927, xxiii, 481.

The author reviews the whole of the discoverable literature on the subject of total infarct of the kidney. There have been apparently no more than 40 cases reported in the literature. The notion of total infarct of the kidney involves necessarily the concept of complete and sudden occlusion of either renal artery or vein. Though the renal vessels are anatomically terminal in nature, functionally there may develop a rather sizeable collateral circulation through the lumbar, the capsular and the ureteral vessels. The infarcts may arise as a result either of thrombosis or of embolus of the renal vessels. The diagnosis has only seldom been made before operation. The symptoms, however, are fairly characteristic. Sudden onset of pain, oliguria, albuminuria and hematuria are the symptoms that should suggest the presence of a renal infarct of large dimensions. The only treatment is immediate nephrectomy.

HELLSTRÖM, JOHN, Göteborg. Contribution to the knowledge of the etiology of hydronephrosis. *Acta Chir. Scandinav.*, July 28, 1927, lxii, 167.

The author relates two cases of hydronephrosis where the pelvic dilatation was probably caused by the oblique course through the pelvic wall of the upper end of the ureter, probably of congenital origin, and a third case where spastic conditions at the ureteropelvic junction had probably occasioned the hydronephrosis.

JOSEPH, E., Berlin. Lithotripsy under visual direction. (*Lithotripsie unter Leitung des Auges*.) *Wien. klin. Wchnschr.*, Aug. 4, 1927, lxxiv, 1314.

Josephs describes a sterilisable lithotrite combined with a cystoscopic lens which permits of the crushing of foreign bodies under the guidance of the eye. In considering the indications for the use of his instrument, Josephs observes that large vesical calculi are to be removed by cystotomy. Only in the case of pure phosphatic stones of unusual size is the

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old method of lithotripsy to be employed. In the case of small stones, lithotripsy under visual guidance is to be undertaken. Lithotripsy is to be used without question in older fat patients, in those suffering from high blood pressure or from diabetes. In the latter case, even after the use of insulin, the author has found cystotomy to be a serious procedure.

TRUMBLE, HUGH C., Melbourne. The treatment of pelvic abscesses. *Med. J. Australia*, July 2, 1927, ii, 4.

Trumble concludes that drainage from the rectum or vagina is immensely superior to drainage through the abdominal wall. It is to be emphasized, however, that only those abscesses which are closed above and which abut directly on the rectum or vagina should be opened from below. The examining finger gives information on these important points.

JARCHO, JULIUS, New York. Uterosalphingography; roentgenological visualization of the cavity of the uterus and Fallopian tubes after the injection of iodized oils. *Surg., Gynec. & Obst.*, August, 1927, xlv, 129.

Roentgenological visualization of the uterus and Fallopian tubes after the intrauterine injection of iodized oil furnishes a valuable means of gynecological diagnosis in selected cases. It outlines the cavity of the uterus and the various portions of the Fallopian tubes with great distinctness.

In cases of sterility, the procedure gives information as to whether the tubes are patent or not and it localizes the site of occlusion if any. It not only supplements the insufflation of gas but often supplants it.

The technique is simple, but strict aseptic precautions must be taken. Jarcho is opposed to the performance of the test on ambulatory patients.

Proper interpretation of the roentgenological findings requires experience. In some cases, it is advisable to examine plates exposed at successive intervals or from different angles.

In Jarcho's experience, the intrauterine injection of iodized oil is entirely harmless, and no manifestations of iodism have been observed.

KERWIN, WILLIAM, St. Louis. Ligation of the uterine arteries for control of hemorrhage in placenta previa. *Am. J. Obst. & Gynec.*, August, 1927, xiv, 189.

Kerwin finds that ligation of the uterine arteries in placenta previa, a procedure described by Harold Miller in *Am. J. Surg.*, in 1909, completely controls hemorrhage.

It is simple and can be done in a few minutes by any qualified obstetrician either in a hospital or at home, without injury to the ureters and without incision.

BONNER, ADOLPH, Brooklyn, N. Y. Carcinoma of the cervix in a thirteen-year-old patient. *Am. J. Obst. & Gynec.*, August, 1927, xiv, 175.

This case of adenocarcinoma of the cervix in a thirteen-year-old girl is the third below the age of fourteen recorded in the available literature. Carcinoma of the cervix below the age of twenty is extremely rare. Cervical carcinoma is not rare between twenty and thirty and the danger of employing the expression "cancer age" literally is obvious. There are many cases of carcinoma of the cervix reported in nulliparous women.

HEINEBERG, ALFRED, Philadelphia. The use of radium in the treatment of endometrioma of the rectovaginal septum. *Am. J. Obst. & Gynec.*, August, 1927, xiv, 235.

Heineberg says that there is a distinct field for the use of radium in the treatment of adenomyoma of the rectovaginal septum especially in those instances in which the tumor is not small enough to be easily removed through vaginal incision, and not so large that all of it cannot be brought under the influence of radium embedded within it. Its use in properly selected cases avoids the necessity for abdominal incision and unsexing the patient.

ROBERTS, M. HINES, Atlanta, Ga. Intracranial hemorrhage in the newborn. *Southern M. J.*, August, 1927, xx, 642.

Four hundred and fifty routine lumbar punctures were made. Sixty-three, or 14 per cent, of all infants showed macroscopic blood in the spinal fluid, a figure somewhat higher than that found by Sharpe and his associates in similar studies. The percentage of infants showing intracranial hemorrhage in the premature or abnormal labor groups is far in excess of those for the full term and normal delivery groups. In only one case does there seem to be definite evidence of any intracranial lesion. Two others might be classed as doubtful. One is led to believe that the great majority will grow up entirely free of any disorder



attributable to cerebral hemorrhage, though it might be easily possible that some of the obscure mental states coming on later in life, for example epilepsy, could have as their basis such a pathological condition.

MEISEN, V., Copenhagen. Injection treatment of varicose veins and their sequelae on basis of 500 treated cases. *Acta Chir. Scandinav.*, July, 28, 1927, lxii, 17.

Since his last communication on this subject Meisen has treated 500 cases of varicose veins including 135 complicated by ulcer cruris and 140 by chronic eczema. The significance of the local, frequently hidden varices and the intimate topographical relation between the varices and the complications form the main part of this article. This is a detail of the greatest significance to this question, because it enables us in each case to make a sure prognosis, and because it gives us a method by which we may cure the very largest number of these complications, no matter how extensive or how old.

The 500 cases received 2224 injections, i.e., an average of 4 to 5 per individual. There were 130 men and 370 women. Fifty-five of the patients gave a past history of phlebitis.

The varicose veins were complicated by chronic eczema of one to ten years' duration in 40 cases, by ulcer of one-half to forty years' standing in 135 cases.

At the discharge of the patients the ulcer was healed in all but 2. There have been only a very few relapses of ulcer, and these were promptly healed by a brief additional treatment.

Whatever the cause may be, the operative treatment of varices frequently gives rise to a relapse of the condition, while the injection treatment does not appear to do so. Weisen is of opinion that the explanation is to be found in that the operative treatment cannot be made sufficiently radical for the reason that the anastomoses cannot be included in the treatment; and the anastomoses are possibly the point of origin of the relapse. The injection treatment, on the contrary, is an elective treatment, because it obliterates all the vein trunks where the blood stagnates or nearly stagnates, varices and anastomoses, while the injected fluid probably is washed away by the circulating blood, should it enter the normal veins.

In palpating the varices it is absolutely necessary to have the patient place the body

weight on the affected extremity, if one expects to locate the varices that are to be obliterated. This treatment depends on finding the hidden varices, and that, perhaps, is a matter of training.

Meisen has had no death and no accident with lasting consequences. Severe complications requiring confinement to bed amount to 1.6 per cent of the total number of treated cases.

Meisen now never uses more than 10 c.c. as maximal dose per injection, and considers 25 c.c. as an "infarct-giving dose."

Technique. The patient must stand on a pedestal, a low table or a high chair. Both lower extremities must be bared. By having the patient alternately rest on each foot, one can see which varices are most in need of being obliterated. Compressing the extremity by a rubber band is inadequate and objectionable; in doing so one produces an artificial stasis of all the veins of the extremity. The needle must be sufficiently large to permit the free passage of the blood and the fluid. Meisen uses a solution consisting of equal parts of sodium salicylate, 25 per cent and sodium chloride, 10 per cent.

If this is not effective, then only he uses 25 per cent sodium salicylate, and very rarely 30 per cent, never higher.

The maximal dose per injection is 10 c.c. The needle is inserted with the patient standing. When blood exudes, the syringe is rolled a couple of times between the fingers to make sure that it is not caught by the opposite vein wall. Then the patient is requested to lie down. One must watch the syringe all the time, while the patient changes his position. After a moment the varices are void of blood, and the injection may commence. Like all other intravenous injections, it should be done slowly. In order to avoid necroses, always ask the patient whether *he feels any pain*. If so, discontinue at once. Likewise if the piston meets any resistance. At one spot, however, the injection is always painful—the region of the malleoli when an ulcer is present.

After the injection, and while the leg is still elevated, a gauze pad is laid on, and an elastic web bandage. This exerts a very strong compression, and is an essential part of the treatment.

The injection is repeated every other day, if no tenderness develops. If both legs are attacked, one may inject them by turns every



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day. For practical reasons one rarely gives more than one injection a day.

The injection treatment of varices ought to replace the operative treatment, because it is less dangerous and offers far greater advantages, specially as to the sequelae, ulcer cruris and eczema, which it cures permanently in almost every case.

Ulcus cruris is practically always due to varices, even if these are not visible externally, and ought to be treated accordingly.

Pain is the principal indication for the treatment, as ulcer is a very painful ailment.

In the 500 cases were 14 recurrences after operation, 12 recurrences in 150 additional cases. The relapses indicate that the blood from the deeper veins is forced out through the anastomoses.

During the last four months, while a new technique and a new injection fluid have been used, there was no complication.

In 35 cases of hemorrhoids this method has given excellent results.

ALLEN, ARTHUR W. End-result in circulatory diseases of the extremities treated by periarterial sympathectomy. *Boston M. & S. J.*, Aug. 25, 1927, cxvii, 304.

In his last group of eight cases, Allen had two trophic ulcerations in spinal cord lesions healing quickly following sympathectomy, one arteriosclerotic ulcer almost healed, and one trophicneurosis relieved entirely of pain for six months. A long standing case with Raynaud's syndrome plus lues, an atypical thromboangiitis obliterans, an irritative nerve lesion, and a scleroderma were unchanged.

Periarterial sympathectomy has a very limited field. In a case with adequate circulation with vasomotor and trophic disturbances of short duration, where proper protection can be given afterwards, it may be justifiable. It is undoubtedly followed by a temporary hyperemia more effective than that produced by electrical or mechanical measures, which aids in the healing of stubborn ulceration. It must be remembered, however, that the cases benefited by it will probably heal with a longer period of palliative treatment.

The combined operation of Royle and Leriche as used by Adson may be more effective than periarterial sympathectomy alone, but it is a much more serious undertaking and not without danger. Allen thinks that ramisection alone as advocated by Royle is just as effective

as the combined operation and is a safer procedure. No ill effects from periarterial sympathectomy were observed in any of his cases.

HURLEY, WILLIAM R. Subfascial hemorrhage of the thigh. *Boston M. & S. J.*, Aug. 18, 1927, cxvii, 261.

In injuries to the thigh severe and even fatal hemorrhage may occur with very few local signs indicating the presence of such a condition. In cases of thigh injury, careful watch of the condition of the patient should be maintained, particularly with respect to pulse and respiration.

Should symptoms of internal hemorrhage occur, and increase in severity, comparative measurements of both thighs should be made, and in the event that the injured member is larger and also shows tenderness and tension, exploration of the thigh is indicated.

Hurley reports a case and refers to those reported by Larkin.

JACKSON, R. H. Madison, Wis. Simple uncomplicated rotary dislocation of the atlas. *Surge. Gynec. & Obst.*, August, 1927, xlv, 156.

Uncomplicated rotary dislocation of the atlas occurs more commonly than is supposed and may easily be overlooked. If the lesion is not recognized and reduced, it may result in sudden death from an increase in the dislocation or it may lead to the development of myelitis months or years after the injury. Rotary dislocation of the atlas is a distinct clinical entity presenting a characteristic history and symptoms with physical findings verifiable by roentgen examination. Effort should be made to reduce the dislocation including, if necessary, resort to open operation.

CONWELL, H. EARLE, Fairfield, Ala. Treatment of acute comminuted fractures about the elbow joint: Report of sixty cases. *Southern M. J.*, August, 1927, xx, 579.

Consideration is given only to those cases in which severely traumatized soft parts and comminution of the bone were encountered, making the routine treatment by the Jones method impossible. Such cases are unsafe to treat outside of a hospital, because frequent daily inspections are necessary. Treatment of the injury to the soft parts is necessary.

The age of the patients varied from two to sixty-five years. Swelling is in no way a contra-indication to immediate attempt at reduction

and functional results are in direct ratio to the elapsed time between the accident and the reduction of the fracture. Immediate manipulation and reduction is carried out under general anesthesia, if conditions permit, and adhesive plaster for traction on the arm and forearm is then applied and the operator holds the arm and forearm in place and accompanies the patient to the ward, where traction is applied to the forearm and the arm with the aid of the author's abduction frame, here described. The traction to the arm and the elbow has a definite tendency to press gently on each side of the elbow, aiding approximation of fragments, with the assistance of two lateral fixation splints. The amount of traction on the arm used is from four to twelve pounds, dependent on the size and age of the patient. Less weight is used on the forearm, the object being to place sufficient traction barely to allow the elbow to touch the board where the arm rests. The abducted position of the arm at the shoulder prevents any rotation of the lower fragment of the humerus on the upper fragment. The frame and traction make dressings, treatment and frequent inspection of the elbow very easy, and allow for adjustments and active and passive motion as well. The amount of elbow flexion allowed in the beginning varies with the type of fracture and the amount of swelling. (In the majority of cases in this series the swelling about the elbow was so great that it was impossible to secure more than right angle flexion without obstructing circulation.) Flexion is gradually increased from day to day, as the swelling disappears, in all fractures until almost the full amount of flexion is obtained, usually in five to six days following injury. Extension is usually accomplished within ten or twelve days following injury, with daily manipulation just to the point of pain to the patient. Active motion is allowed as early as the patient can be persuaded to carry it out.

No forced motion should ever be carried out during the post-hospital period. Let the patient do all the motion, but force the patient. Take care always to prevent undue tenderness or pain. If any tenderness or pain should occur, allow the limb to rest as regards motion, but keep up hot baths, radiant light and other forms of physical therapy.

SPEED, KELLOG, Chicago. A new type of fracture of the calcaneus, with discussion of the

common injuries of this bone. *S. Clinics N. America*, June, 1927, vii, 583.

The type of fracture in two cases reported here does not fit into the usual four types.

The mechanism of these two unusual fractures of the calcaneus is probably as follows:

The patient sustains a sudden slight fall or impaction on the foot, which is probably held in some inversion and with the sole cupped as in pes cavus. The violence is not great enough to cause compression fracture of the whole bone or fracture of the sustentaculum, but the impact brings enough force against the sole of the foot to shorten the lateral portion of the plantar fascia and the flexor digitorum brevis, the abductor digiti quinti, and quadratus plantae of the foot on its side. This shortening in the muscles and fascia already under tension causes the origin of the muscles from the outer anterior under surface of the tuber calcanei to be pulled out, taking a small bone fragment with it. This bone fragment may lie up under the ordinary outline of the calcaneus as seen in the lateral view; it may be in profile. The broken off bone fragment is pulled plantarward and anteriorly and lies sticking down into or toward the plantar tissues.

If the bone fragment is not seen in the first roentgenogram, no fracture is diagnosed. Walking and use of the foot cause pain from pressure against this fracture fragment. The pain will continue for a long time.

To diagnose this fracture of the calcaneus there will be found:

1. Pain and tenderness on the outer aspect of the calcaneus near its middle.
2. Scarcely any swelling or ecchymosis (held back by plantar fascia).
3. Pain referred to the heel when the little toe is dorsal flexed or abducted, or when the plantar fascia on the outer side of the foot is tensed by pressure.
4. No change in relation of malleoli at ankle.
5. No change in hollows about heel posteriorly.
6. Prolonged disability when weight-bearing is attempted.

The treatment must be freedom from weight-bearing until acute pain and reaction subside. This will be six to eight weeks. If pain then recurs when shoes are worn, a soft pad may be put like a bunion plaster around the tender point beneath the heel.

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The ultimate prognosis is good, as pain will eventually disappear. If the fracture is not recognized and weight-bearing is encouraged, the disability may extend for months.

All suspected fractures of the calcaneus should have not only anteroposterior and lateral roentgenograms, but a third film should be made with the inner side of the foot raised so that there is about a two-thirds lateral view to throw into profile any bone fragments torn off from the plantar surface.

LEHMAN, EDWIN P., and COLE, WARREN H., St. Louis. Parathyroid hormone and the calcification of fracture callus. *J. Am. M. Ass.*, Aug. 20, 1927, lxxxix, 587.

On the assumption that, because the injection of parathyroid extract increases the calcium in the blood stream there will be more available calcium for deposit in fracture callus, have been based certain clinical trials of parathyroid extract in the treatment of delayed union of fractures. It is the belief of LEHMAN and COLE, that parathyroid extract is being widely used on the misapprehension that it is of such value. They undertook experiments which present evidence that the favorable results in delayed union that have occurred following the use of parathyroid extract have not come from any beneficial action of the hormone. Four litters of white rats totaling forty individuals were employed. In the white rat, the injection of parathyroid extract does not hasten the calcification of fracture callus. If the injection of parathyroid extract has any influence on the rate of calcification of fracture callus, it tends to delay it. The untreated controls showed an average callus strength of 69.6 per cent of the strength of the normal bone, as compared with 63.7 per cent in the rats given parathyroid injections.

HENRY, ARNOLD K., Cairo. An operation for slinging a dropped shoulder. *Brit. J. Surg.*, July, 1927, xv, 95.

A method is described by which a case of shoulder-drop due to surgical paralysis of the spinal accessory nerve was successfully treated by slinging the scapula to the spines of the sixth cervical and third dorsal vertebrae by means of two 10 in. by 1/2 in. fascial strips taken from the thigh and passed through holes drilled in the vertebral border of the scapula.

COX, H. HOYT, Chicago. Acute backache—diagnosis and treatment. *S. Clinics N. Am.*, June, 1927, vii, 663.

To reduce a sacroiliac subluxation the patient is placed on the table face downward, his weight being supported by the elbows and abdomen and his hands grasping the edge of the table securely. The surgeon stands on the table and lifts the patient by the ankle so that the abdomen is clear of the table and is supported only by the elbows above, making strong traction on the affected limb while his assistant makes firm pressure over the sacrum. The lumbar curve is now restored and the patient's pain disappears. He is then strapped securely with 2 inch adhesive straps extending from below the trochanters to the crest of the ilium.

The explanation of the manipulation is as follows: In lifting the patient's body by the ankles we hyperextend the spine and thus relax the strong posterior sacroiliac ligaments and also relieve the joint from the pull of the hamstrings. The strong pull upon the leg unlocks the joint by increasing the deformity by the pull of the quadriceps muscles attached by the upper part of the ilium. The weight of the body and the downward pressure over the sacrum favor replacement of the ilium backward by forcing the sacrum forward.

Cox advises the patients to go to bed for one week or longer, depending upon the severity of the injury and the time which has elapsed before proper treatment has been instituted. Occasionally and especially when a history of previous subluxations exists a firm belt with a sacral pad, facing down below the trochanters and extending to the level of the iliac crests, should be worn for several months. These patients should be warned against stooping or sudden twisting of the body. The majority of acute backaches are due to sacroiliac subluxations and their response to the treatment shown is little short of spectacular.

HIRSCH, EDWIN F., and CAPPS, J. A., Chicago. Paroxysmal cyanosis associated with bilateral thrombosis of the suprarenal veins. *Arch. Int. Med.*, July 15, 1927, xl, 112.

This is a report of the clinical symptoms in a patient with bilateral thrombosis of the suprarenal veins and acute retrogressive changes of the suprarenal glands in whose body a post-mortem examination did not disclose any other complicating lesion. In addition to the usual symptoms of supra-

renal insufficiency, such as asthenia, low blood pressure, gastrointestinal disturbances and syncope, there were sudden attacks of extreme cyanosis, associated with dyspnea and unconsciousness.

The suggestion is made that the cyanosis is due to suprarenal insufficiency rather than to weakness of the heart, and that the suprarenal gland may play a rôle in the utilization of oxygen by the tissues.

CABOT, HUGH, and RANSOM, HENRY K.,  
Ann Arbor. Ethylene as an anesthetic for  
general surgery. *Ann. Surg.*, August, 1927,  
lxxxvi, 255.

Ethylene has all of the advantages of nitrous oxide and oxygen and also gives greater relaxation and avoids objectionable cyanosis. It appears to be remarkably free from danger except that possibly resulting from explosions. It will not give complete muscular relaxation particularly for operations in the upper abdomen, and if this is required, it must be combined with local or regional anesthesia if it is used. In the authors' practice it has practically pushed nitrous oxide from the field and will, they believe, for ordinary surgical practice, supersede it. It is not an anesthetic which can be employed except where trained anesthetists are on hand and a rather cumbersome apparatus is available. It is not likely, therefore, to supersede ether or chloroform for use outside of hospitals, but for general hospital practice, it has outstanding advantages.

SNELL, ALBERT M., Rochester, Minn. The  
relation of obesity to fatal postoperative  
pulmonary embolism. *Arch. Surg.*, August,  
1927, xv, 237.

It seems probable that there is a group of patients over fifty years of age, obese and with normal or subnormal blood pressure, who are particularly susceptible to pulmonary embolism as a postoperative complication.

PHEMISTER, D. B. A study of the ossification  
in bone sarcoma. *Radiology*, July, 1926,  
vii, 17-23.

For purposes of roentgenologic study of their ossification, bone sarcomas may be divided into four main groups: (1) those containing tumor bone only; (2) those containing tumorous and non-tumorous bone; (3) those

containing non-tumorous bone only; (4) those containing no new bone.

(1) *Bone sarcomas containing tumor bone only* are seen mainly in adults, and are either osteogenic or chondrosarcomas. Osteogenic sarcomas usually arise centrally, erode the cancellous bone and cortex and make a lesion which fills much of the space in the end of the shaft and also appears soon as an external swelling. The degree of ossification varies but is often marked. The new bone forming in the portion of the tumor within the old bone has an irregular spongy arrangement. The external swelling is usually dense and spongy in its deeper portions, but there may be radiating spicules about the periphery. There is no layer of non-tumorous periosteal new bone tapering off on the shaft about the limits of the tumor. Examples are cited from two cases. Radiotherapy exerts little influence on markedly ossifying sarcomas such as occurred in these cases; both had received intensive treatment without noticeable effect.

Primary chondrosarcomas usually show some tendency to calcification and ossification. They may begin peripherally or centrally, a moderate amount of calcified cartilage and bone may appear and these may form islands separate from the old bone. In roentgenograms, isolated calcareous shadows within the confines of a tumor, either primary or metastatic, are almost pathognomonic of chondrosarcoma.

(2) *Bone tumors containing both tumorous and non-tumorous bone* are seen mainly in adolescents. At this age an osteogenic sarcoma with radiating new tumorous bone may stimulate periosteum to form a varying amount of non-tumorous bone on the shaft beyond and along the uninvolved cortex at the level of the tumor. An example of this type of tumor occurring in a boy aged seventeen is cited.

(3) *Bone sarcomas containing non-tumorous bone only* occur also largely in adolescents, and are central destructive lesions which stimulate the periosteum of the vicinity to new bone formation. The non-tumorous new bone has the same characteristic as that described in Group 2. Occasionally there may be irregular ossification about the periphery. Ewing's endothelioma is particularly apt to produce this picture. Radiating, non-tumorous bone, usually limited in amount, may form within the tumor as an outgrowth from the old cortex. An illustrative case is briefly cited.

Telangiectatic sarcomas in adolescents or young adults invade both the cancellous bone and medullary regions and extend through the cortex making a peripheral swelling. They break down rapidly leaving a cavity with only a small amount of living tumor about the

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periphery. A small amount of non-tumorous bone may be formed by the periosteum about their limits, but it casts little shadow so that roentgenographically one sees mainly bone destruction and the shadow of the soft parts of the tumor.

(4) Bone sarcomas containing neither tumorous or non-tumorous bone, or at most only traces of ossification are common in adults. They arise nearly always centrally although there is occasionally a primary periosteal fibrosarcoma of this type. When small and confined almost entirely to the bone they may be confused roentgenologically with central giant cell tumor, but their outline is much more irregular than that of the latter. They enlarge rapidly and invade the soft parts surrounding the bone. New bone does not form from the periosteum about their periphery. They usually run a rapid course and produce metastases which also are free from ossification. An example is cited of a large central sarcoma of the upper end of the ulna amputated eight months after onset in a man aged twenty-seven.

PRIBRAM, B. O., GRUNENBERG, K., and STRAUSS, O. Cholecystography and its diagnostic significance. *Fortschr. a. d. Geb. d. Röntgenstrahlen*, February, 1926, xxxiv, 235-244.

The roentgenological demonstration of the gall-bladder with the aid of contrast dyestuff permits the diagnosis of calcareous gall-bladders, stenosis of the cystic duct, ptotic gall-bladders, etc., with relatively great certainty. On the other hand, when yielding a normal gall-bladder picture it constitutes a reliable means for excluding disease of the gall-bladder. For the diagnosis of pericystic adhesions and altered position of the gall-bladder, it is desirable to obtain additional evidence by means of a collateral duodenal filling and also to make a study of serial roentgenograms of the ability of the bladder to empty and to contract.

The examination should be made primarily upon the gall-bladder which has been emptied. In order to avoid interfering reactions, a prophylactic injection of atropin would appear to be highly desirable. The infusion of dye is best carried out with the aid of an infusion cylinder and should be conducted very slowly. Tetraiodophenolphthalein is preferable to tetrabromphenolphthalein for injection. The quantity sufficient for ordinary purposes is 3 gm., at a maximum 5 gm. The intravenous method has been found to give more reliable results than the oral. The authors recommend the method very highly and regard it as entirely without danger provided the necessary precautions are followed.

REICH, LEO. Diaphragmatic hernia of the right lobe of the liver. *Fortschr. a. d. Geb. d. Röntgenstrahlen*, April, 1926, xxxiv, 481-484.

Reports are given of 2 cases. In the first which occurred in a man aged thirty-two a pneumoperitoneum caused a pneumothorax and thus helped to disclose the nature of the condition. The herniated abdominal structure within the thorax was found by a method of exclusion to be the liver. The introduction of contrast material per os or per rectum caused no change in the appearance of the herniated structure. The latter also exhibited considerable mobility with change in position of the patient. The diagnosis in this case was spurious traumatic diaphragmatic hernia of the right lobe of the liver.

The second case occurred in a man aged fifty-nine who gave a picture very similar to that seen in the first case. Here also the pneumoperitoneum assisted in the differential diagnosis by failing to give a simultaneous pneumothorax. The condition was diagnosed as paralysis of the phrenic nerve due to lead poisoning.

REISER, EGON. Theoretical and personal observations on myelography. *Fortschr. a. d. Geb. d. Röntgenstrahlen*, April, 1926, xxxiv, 443-455.

The suboccipital injection of 2 c.c. lipiodol has never resulted in any injury to a patient. It is possible and very desirable to observe the settling of the contrast material roentgenoscopically. It may be expected that such observation in conjunction with a suitable roentgenographic technique (patient in oblique recumbence, i.e., partly upright) will lead to early diagnosis of small tumors. The suspected region should be roentgenographed before the introduction of the lipiodol so as to obtain a record of all changes in the spinal column without interference of foreign material. Such roentgenograms are of importance in the differential diagnosis. These and all other pictures should be taken both sagittally and laterally (or obliquely).

When the contrast material has been introduced and its progress to the narrowed region traced, roentgenograms should be taken with the patient in the recumbent and in the upright or semi-upright positions. The roentgenograms in the recumbent position frequently show the course of the spinal cord above the point of compression, because the medulla frequently appears as a clear space within the shadow of the contrast material or within two marginal strips. The upright or semi-upright position produces an intimate contact of the lipiodol with the structure which is blocking the spinal

canal. The lower portion of the filling shadow in these roentgenograms indicates the shape of the compressing agent, which may be lost in roentgenograms taken in the recumbent position.

Primary intradural tumors may be recognized as spherical, convexly outlined, clear areas below or within the filling material. Connective tissue atrophy may also produce clear areas, but these usually have a straighter or a concave boundary. This picture may also be exhibited by extradural tumors. Not infrequently, the tumor may be covered over with adhesions, and if the latter should happen to coat the tumor closely like a skin then the picture of the conditions in the zone of compression will not be appreciably disturbed. Should, however, the adhesions be extensive, they may keep the contrast material from reaching the actual point of compression, and it will then be impossible to form any opinion as to the shape of the pathological process producing the compression. Within the clear areas, there may appear disturbing shadows produced by skeletal structures which render difficult the morphological interpretation of the myelogram. Such interferences are mainly due to the spinous processes.

A series of 5 cases is described and pictured.

RUGGLES, HOWARD E., and BRYAN, LLOYD.  
Bone malignancy from the roentgenological aspect. *Radiology*, July, 1926, vii, 24-28.

At the present time one can recognize with fair accuracy typical examples of the following primary tumors: (1) giant cell tumor; (2) osteogenic sarcoma; (3) undifferentiated osteogenic sarcoma; (4) endothelioma; (5) myeloma. There are many borderline and atypical lesions which are not clean cut either roentgenologically or pathologically.

*Giant cell tumors* have a characteristic appearance. They present rarefied areas, showing thin-walled trabeculae somewhat suggestive of soap bubbles. There is asymmetrical expansion of the affected region with a tendency to follow into processes and condyles. They extend to the joint cartilage but do not invade it. There is no periosteal reaction unless fracture is present. They are most common in the age period twenty to forty years. Malignant changes are possible but extremely rare.

*Osteogenic sarcoma* is practically always seen in the distal third when it occurs in long bone. A location in the middle third of the shaft is strong evidence against an osteogenic tumor. These growths appear before thirty, tend to recur locally and produce pain, fever and metastases. Roentgenologically the subperiosteal is the most common form. It begins as an

irregular erosion of the cortex with very early elevation of the periosteum and new bone formation at the margin of growth. This is its most important characteristic. In rapidly growing tumors this limiting reaction of the periosteum may be absent. As the process develops the marginal reaction increases, erosion of the cortex becomes more prominent, the medulla is involved and a variable amount of calcification appears in the soft tissue tumor. The medullary form gives an irregular area of rarefaction in the cancellous bone showing no well organized trabeculation within it. Rupture of the cortex and extension into the soft tissues occur easily. Lesions of the flat bones are usually of the medullary type with bone destruction as their predominant feature. In some cases there is an amount of trabeculation which gives them a strong resemblance to giant cell tumors.

*Undifferentiated sarcoma* is a purely destructive process which takes everything before it. The lesions have fairly sharp irregular margins and there is no trace of bone reaction.

*Endothelioma* appears in two forms probably depending upon whether it develops from the blood vessels of bone substance or of marrow. In the first form they are similar to osteogenic sarcoma and may be diagnosed as such. They are situated somewhat farther from the ends of the long bones and there is more localized destruction of the cortex. There is usually more periosteal new bone formation which may occur in layers partially or completely surrounding the tumor. The second form produces a mottled or coarsely trabecular structure in the affected bone, somewhat suggestive of osteitis deformans in some cases and of myeloma in others. Usually a considerable portion of the shaft is involved. In the flat bones it may resemble giant cell tumor. The second type may be separated from myeloma by the fact that it is a single lesion and by the absence of albuminuria. Endothelioma does not expand the bone as strikingly as giant cell tumor and the trabeculation is heavier and coarser.

*Myeloma* appears in multiple foci, always in cancellous bone and is most common in ribs, sternum, vertebrae, skull, femur and pelvis. The tumors are small nodules or large bulky growths, chiefly in males of the fourth and fifth decades. They produce considerable deformity in bone outline due to irregular growth and they usually show coarse trabeculation. Individual lesions in flat bones may resemble giant cell tumors or endotheliomas, but the presence of other lesions will exclude them.

Out of a total of 650 cases of bone sarcoma in the Registry there are 26 per cent of giant cell tumor, 40 per cent osteogenic sarcoma, 10 per cent endothelioma and 2 per cent myeloma.



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The authors' material consists of 72 cases of bone malignancy from a total of 220,000 cases, or one case for every 3000 examinations. These are tabulated according to age and localization of the tumor.

SWANBERG, HAROLD, and MONTGOMERY, E. B. Solitary diverticulum of the jejunum. *Radiology*, August, 1926, vii, 144-148.

A report is given of a case occurring in a woman aged fifty-five in whom the solitary diverticulum of the jejunum was diagnosed roentgenologically but not confirmed by operation. The patient had been suffering from periodic vomiting, the cause of which was obscure. The barium meal readily entered the stomach which began to empty at once giving an appearance similar to that in which a large gastroenterostomy has been done. There was a normal gastric contour except on the greater curvature, in its middle part, where there appeared to be a distinct large bulging as if a diverticulum were present. The sacculatation was nearly oval, measuring about 6 cm. in its greatest diameter. At six hours the head of the meal was in the transverse colon and a small mentioned sacculatation which still contained barium. At twenty-four and forty-eight hours barium was scattered throughout the colon but the same sacculatation still contained barium. Views from different angles showed that the sacculatation was not connected with the stomach but posterior to it presumably of the jejunum.

The roentgenologic findings and the clinical history of acute intestinal obstruction point clearly to a diagnosis of large diverticulum of the beginning portion of the jejunum.

TARTAGLI, DINO. A case of idiopathic dilatation of the esophagus. *Radiol. med.*, October, 1926, xiii, 711-719.

A case is described in a woman aged sixty in which both the clinical and roentgen signs were typically those of idiopathic dilatation of the esophagus. All the signs of disturbed motility of the esophagus were evident. From the signs in his case the author doubts the reliability of Holzknecht's test and in studying the pathogenetic mechanism of the condition he arrives at a hypothesis similar to Hurst's of achalasia, or defective relaxation, of the cardia. A nervous incoordination, probably due to lesion of vagus filaments, causes a defective relaxation of the cardia. The part of the esophagus above it suffers motor incoordination as a result, and reacts with hyperperistalsis or possibly antiperistalsis. The increased peristaltic contractions cause changes in the delicate wall of the esophagus gradually leading to

hypertrophy, but if the primary disturbance persists it will finally exhaust the defensive power of the esophagus whose walls will gradually dilate, with consequent decrease and finally total disappearance of the peristaltic wave. It is in this stage of complete idiopathic dilatation that the patients generally present themselves for treatment.

TURNER, GEORGE. Actinomycosis of the lungs. *Radiology*, July, 1926, vii, 39-43.

Any continued chest infection in which there is no evidence of tuberculosis should be considered as a possible ray fungus infection and study should be made of the sputum and the roentgenograms with this in mind.

From a roentgenographic point of view there are two types of actinomycosis of the lungs. In one type the infection involves the hilus and extends along the bronchi producing peribronchial infiltration with extensive fibrosis. The extension is more likely to travel downward than upward. The granulomatous masses are miliary in size and very dense along the inner lining of the bronchi. When these granulomas suppurate, expectoration is profuse, usually blood-stained and containing actinomyces.

The other type of actinomycosis involves the lung tissue proper and presents a picture of abscess. Pleural involvement soon occurs with possible empyema and fistulous tracts through the skin. The infection may begin as a bronchial type and continue as a severe and stubborn bronchitis when a well-defined circumscribed area will appear in the lung tissue. A tendency of the disease is to jump across what appears to be normal tissue. The lesion is more progressive than the usual lung abscess found in tuberculosis or after pneumonia. By making roentgenograms at intervals of about two weeks and comparing them the condition can be differentiated from other forms of lung abscess. Syphilis, malignancy and tuberculosis of the lung should be easily differentiated from actinomycosis. It should be remembered, however, that while actinomycosis presents characteristics peculiar to its own form of lesion, there is nothing sufficiently distinctive roentgenologically to permit a diagnosis from roentgenographic examination alone. A correct diagnosis depends on the close cooperation between roentgenologist, clinical microscopist and clinician.

A report is given of a case occurring in a man aged thirty-eight.

DESJARDINS, ARTHUR U. Radiotherapy for lymphoblastoma. *Radiology*, August, 1926, vii, 121-130.

Radiotherapy does not prolong the life of patients suffering from lymphoblastoma. This



does not mean that the treatment does not exert any influence on the disease. It is well known that its clinical manifestations can generally be controlled and that many patients can be restored to a relatively normal state of health for long periods. Massive enlargement of the cervical, axillary and inguinal glands and voluminous mediastinal and retroperitoneal adenopathy can be obliterated. Distressing secondary phenomena such as dyspnea, venous engorgement, toxic pruritus and pleural effusion can often be relieved. Moreover, the reaction of lymphoblastomatous deposits to irradiation is so characteristic as to constitute a valuable therapeutic test when biopsy is not possible.

The above conclusions are drawn from a review of a series of cases receiving more or less systematic treatment with radium or roentgen rays. These include all the patients registered at the Mayo Clinic during the four-year period 1920 to 1923 inclusive. The diagnosis was definitely established by biopsy. There were 57 cases of Hodgkin's disease and 126 of lymphosarcoma. The various statistical aspects of this series of cases are presented in a number of tables.

FERRERI, GIORGIO. Radium surgery of malignant tumors of the ethmoid and superior maxillary. *Radiol. med.*, November, 1926, xiii, 804-825.

Ferreri advocates combined radium and surgical treatment of malignant tumors of the superior maxillary. He describes 5 cases in which he partially resected the bones which were invaded and removed the tumor masses, so that the radiant energy could exercise as deep an action as possible on the normal tissues and bring about an intense defense reaction. Two of the cases were epithelioma, one a malignant papilloma, one a cylindroma and one an endothelioma. In one of the patients there was a local recurrence fourteen months later while the others are all entirely cured. The surgical operations were almost two years ago. He thinks it is very important to make a histological examination of the tumor in order to be able to give a rational and accurate radium treatment, as the dose varies depending on the nature and malignancy of the tumor. He thinks that moderate amounts of radium should be used (15 to 25 mg. radium element) which should be left in contact with the tumor for four or five days so that a dosage of 13 to 20 mc. is given. Care should be taken not to exceed 20 to 25 mc. if all danger of necrosis or sequestration of the neighboring parts is to be avoided. He did not see any local or general disturbance in any of his patients.

HERENDEEN, RALPH E. Diagnosis and results in the radiation treatment of some medullary bone tumors. *Radiology*, August, 1926, vii, 140-143.

In attempting to diagnose bone tumors it is necessary to exclude infection, changes resulting from chronic constitutional disease, atrophy from disuse or pressure as possible causes. The location of the tumor is one of the most important points in the diagnosis of giant cell tumors. Of the conditions least suspected when the diagnosis of giant cell tumor is being considered, and probably more frequent than any other are the osteogenic chondrosarcomas; the next in frequency are the myelomas. Ewing's tumor though medullary in origin seldom has many of the characteristic features of a giant cell tumor. The conditions which simulate it more closely than others are carcinomatous metastases and especially metastases from hypernephroma.

Giant cell tumors, chondrosarcomas and Ewing's tumor all respond differently and in characteristic ways to radiation therapy. There is probably no bone tumor that shows a more immediate or active response to irradiation than Ewing's tumor. Giant cell tumors following a fairly heavy irradiation show a reaction which reaches its height in three to six weeks. The reaction is characterized by redness, swelling and tenderness—sometimes to such a degree that one may suspect the growth to have taken on marked activity. As time goes on the reaction subsides and the tumor becomes firm to the touch. Roentgenograms made later often demonstrate definitely that the tumor is becoming well calcified.

In the case of chondrosarcomas this reaction to irradiation is uncommon. The tumor responds slowly in comparison to other malignant bone tumors. It may be many weeks before any effect of the treatment is visible along with diminution in the size of the tumor. The pain also slowly disappears and at this time a roentgenogram may demonstrate some attempt at ossification or at bone repair.

Although the author does not recommend pre-operative irradiation in malignant bone tumors as a routine procedure, instances are known where the long-continued use of radiation prior to amputation seemed to be a factor in preventing metastasis to the lungs. In these cases the radiation therapy was followed by the production of much fibrous tissue, complete or partial encapsulation of the tumor by fibrous tissue or bony material, and necrosis or degeneration of large areas of the tumor. Amputation should be limited to those cases in the elderly or middle aged where the location and extent of the tumor is such that regeneration of bone

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or rather production following curettage or radiation, will not be sufficient in quantity to restore the limb to usefulness.

It is the belief now at the Memorial Hospital, New York City, as a result of the observation of a large number of giant cell tumors of bone treated by radiation alone during the past five or six years that in most instances the results warrant a trial of radiation therapy before resorting to curettage or amputation.

HOLMES, GEORGE W., DRESSER, RICHARD and CAMP, JOHN D. Lymphoblastoma. *Radiology*, July, 1926, vii, 44-50.

Eight cases of lymphoblastoma of the stomach, with roentgen studies of the gastrointestinal tract are reported. There were observed two more or less distinct types of the disease corresponding with the gross pathology as described in the literature.

In general, the gross manifestations of lymphoblastoma of the stomach may be divided

into two types: (1) that in which the gastric involvement is coincident with a generalized involvement of the gastrointestinal tract, and (2) that in which the stomach alone is involved. Either of these types may or may not be associated with peripheral lymph node enlargement.

The roentgen findings were either negative or closely simulated those of gastric carcinoma. Consequently the possibility of the presence of this disease in all atypical cases showing cancer-like deformities should be considered. In some of the cases the peristalsis was not interfered with to the extent generally seen in carcinoma. In the generalized form of the disease, particularly in its early stages, the roentgenological examination may be negative.

The localized type of this disease should respond well to radiation therapy or to a combination of irradiation and surgery.



## THE PRESENT TREND OF GYNECOLOGY\*

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**T**HIS paper is not presented with the idea that it will add anything new to the reader's knowledge of gynecology, or to the treatment of its several lesions, but in the hope that I may be able to crystallize for him the present-day views on pathology and practice and so place him in a better position to fulfill the service which is required in daily work.

At the present time, when each community has its own small hospital, usually an open hospital, and the surgical furor has seized the profession, gynecology is passing out of the hands of the specialist into those of the general surgeon. While the conditions and disorders peculiar to women are just as varied and require just as keen an appreciation of the peculiar basic pathology, the physiologic resistance and the minute anatomy as do the lesions of the eye or ear, yet few general surgeons hesitate to attack any gynecological problem which may present itself to them, although they would enlist the help of the expert in a case of cataract or sinus thrombosis.

Fortunately, the pendulum has gradually swung from empiricism to a more rational gynecology founded upon physiologic pathology. Perhaps nothing so well illustrates this trend toward the stimulation of nature's resources as does the present-day understanding and the prac-

tice in cases of acute pelvic infection. Infections in the pelvis commonly arise from either a Neisserian, puerperal or operative origin. A study of the life history of each of the infecting organisms demonstrates that each in the course of its invasion has a selectivity for certain tissues, and that likewise nature attempts to erect successive barriers for their isolation and extermination. Therefore it may be stated that surgical procedure in acute pelvic infection is limited to the drainage of localized purulent foci.

Over one-half of the lesions peculiar to women have their origin in childbirth. These are illustrated by the traumas, descensus, cervical infections and displacements—all the direct result of faulty obstetric practice; about three-fifths of the remaining 50 per cent are the direct result of some form of infection.

### GONORRHEAL INFECTION

The initial symptoms of gonorrhea in the female are usually less acute than in the male, in fact it is often subacute or chronic from the beginning, showing few local symptoms except an increase in vaginal discharge. Nevertheless chronic gonorrheal infection is capable of producing greater ravages and a more permanent pathological condition than almost any other form

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of pelvic infection. The acute stage passes rapidly into the subacute or chronic, which is found located in Skene's glands just within the meatus, on the floor of the urethra or as a chronic endocervicitis in the racemose glands within the cervix.

Undisturbed, a cervical gonorrhea remains a local disease and terminates in a pathological entity which is known as a cystic cervicitis; this, however, is always attended by a tissue hypertrophy with increase and change in character of the cervical discharge. Gonococci usually cannot be recovered from these chronic cervical lesions; yet active surgical treatment not infrequently spreads the infection to the endometrium and through the tubes. Skene's glands, on the other hand, harbor these cocci, perhaps somewhat changed in their morphology, but always ready under proper stimuli and virgin contact to relight and reinfect. This explains the frequent exacerbations in so-called chronic gonorrhea *which are in reality reinfections*.

It is now a well-recognized fact that the gonorrheal cervicitis is intractable and can only be cured by glandular destruction or glandular ablation. It has furthermore been demonstrated that no one condition is so frequently the cause of sterility as is endocervicitis, and that infection may be spread to the parametrium, tubes and peritoneum by intracervical and intra-uterine instrumentation with the dilator, curette or stem. A few years ago, these lesions of the cervix were treated with iodine, phenol and tampons; then, as the result of the writings of Leopold, Sturmdorf and others, it became fashionable to excise the cervix. This, in turn, has been followed by the general acceptance of the electric cautery. Time has shown that none of these therapeutic measures can be relied upon to relieve the woman of her leucorrhea, or destroy or remove the entire glandular area which supplies the cervical mucus. Furthermore, operation and cauterization of the cervix are not curing sterility, as the latter seems to change the

character of the remaining mucoid discharge; while the former removes the cervix from its position in and its relation to the fornices and the seminal pool. That excision and amputation have a definite influence upon the development and character of subsequent pregnancies and labor must be admitted by even the most enthusiastic advocates of these procedures.

#### LACERATIONS

Birth injuries occur even in the most expert hands, and the only difference between those in the hands of the midwife and the doctor is, that in a case conducted by the former there is submucous fascial stretching and muscle injury, while in the case delivered by the physician the injuries are open wounds. This perhaps explains why physicians have a larger percentage of infections than the less educated midwife.

Certain obstetric fundamentals seem to have escaped the mind of the physician soon after his graduation: first, that labor takes time; second, that the baby cannot come out before the cervix is open; third, that wounds, especially traumatized wounds, are liable to infection and do not heal *per primam*. There is a general trend at present toward the immediate repair of all birth injuries and while this is most commendable in pelvic floor and fascial tears, we are not convinced of the safety or the necessity of suture of every cervix wound. Such teaching is not free from danger in the hands of the average practitioner; for few realize that at the termination of labor the uterovaginal tract is an open wound, and owing to the severe traumatism which these tissues have sustained has a lowered resistance against infection and is, therefore, more prone to inoculation from the vaginal flora and to the later development of infection. I subscribe to the immediate repair of birth injuries when there is little trauma or edema; and to the intermediate repair on the seventh day of old injuries or new ones when there has been an operative

delivery. These repairs are definitely surgical procedures which require the most perfect asepsis, knowledge of the pathology and the avoidance of all tissue constriction by suture material. Could we secure the coaptation of such tears without tension in non-edematous tissues, primary cervical repair would result in a condition similar to that which obtained before delivery.

It is generally accepted that cervical injuries predispose to the development of cancer; likewise, the presence of erosions favor malignant changes. Yet, one must not lose sight of the fact that all repair work is subject to some degree of destruction at subsequent births; hence it is the present obstetric and gynecologic practice to take care of the inflammatory lesions in the cervix by appropriate post-partum care and postpone operative procedures until a time when the woman has finished her childbearing. Postponement of cervical repair would always be possible if dilation was accomplished by the physiological factors which enter into the mechanism and were it not for the impression that has gained support among the rank and file, i.e., that the cervix can be dilated by other means than nature has supplied for the physiological process. However, the fact remains that manual or instrumental dilatation is in fact manual or instrumental laceration; while dilation, as accomplished by time and the intact membranes, leaves little injury to be repaired.

#### FIBROIDS

Fibroid tumors of the uterus are among the common neoplasms found in women in the fourth decade of life. The fact that a woman has a fibroid does not mean that this fibroid requires operation, for many fibroids exist and produce no symptoms, *but all fibroids need watching*, for at some time in their development the majority have some circulatory change or grow under the stimulus of repeated menstruation, pregnancy and infection and produce menstrual changes or pressure effects.

It is, therefore, important for the physi-

cian to appreciate the relation which location and circulation has to the life and development of a fibroid tumor. The life history of every fibroid depends on its location and its relation to its circulation. Its development is limited almost to the period of sexual activity. The growth does not invade the wall of the uterus but merely expands it; the growth is in the myometrium *but not of it* and the uterus is constantly contracting and evolving the tumor in the direction of least resistance. Hence all submucous tumors are subject to intrauterine extrusion and ultimately a metrorrhagia, terminal necrosis and intermenstrual discharge; while almost all subperitoneal tumors at some period of their development will become extruded, pedunculated and tortuous, or grow and produce pressure symptoms referable to the bladder, rectum, pelvic veins, pelvic nerves or digestive tract. Only the intramural growth which is of slow development is possible of disappearance from atrophy.

Therefore, in selecting an operative procedure one has to determine which growth is amenable to radium and which growth requires hysterectomy or myomectomy. Only by proper individualization can the selection of the form of treatment be arrived at, for tumors which are adherent and incarcerated in the true pelvis, obstructing the rectum or ureters or distorting the bladder, always demand surgery. On the other hand, intramural tumors of the size of a three months' pregnancy in which menorrhagia is the prominent symptom can be cured by radium or roentgen ray. It is, therefore, a good rule never to elect a procedure for the removal of a fibroid without making the most careful and painstaking examination under anesthesia, to determine the location of the tumor or tumors, their relation to the uterine cavity and circulation as well as their characteristics, fluctuancy and density.

Clark and Keen's contraindications to radium should be in the hands and in the heads of every man who proposes to use

radium therapy. Conditions which they consider to contraindicate roentgen ray and radium may be summarized as follows:

(1) Tumors larger than a three months' pregnancy, though in emergency in larger tumors, either may be employed to temporarily check the hemorrhage.

(2) Rapidly growing tumors which suggest progressive changes.

(3) Tumors producing pressure symptoms.

(4) Tumors associated with pelvic pain.

(5) Pedunculated tumors in which radium only tends to increase the necrosis.

(6) Tumors with associated adnexal pathology.

(7) Tumors with associated secondary anemia (the patient having a cachectic appearance) in which the uterine hemorrhage has not been sufficient to account for the degree of anemia.

(8) Tumors in young women.

(9) Multiple submucous growths in which the character of the mass cannot be definitely differentiated, or in women who have a fear of radium. All of the foregoing conditions are better and more safely treated by surgery.

#### PREOPERATIVE PREPARATION

This is being better and better understood by the operating surgeon. Dehydrated patients are benefited by intravenous infusions of glucose and many of these, in whom the hemoglobin is low, require transfusion. All patients should have twenty-four to forty-eight hours' rest in bed before being subjected to operation. A high or exceedingly low white blood cell count and a rapid sedimentation time are bad operative prognostics. After operation nature's demand for fluids, chlorides and glucose is being satisfied by intravenous infusion and copious hyperdermoclysis; as a result postoperative convalescence is consequently less trying and stormy.

#### STERILITY

Probably no condition has received so much painstaking study as the study of

sterility. Formerly it was empiric to dilate and curette the uterus of every barren woman, and numberless plastic operations on the cervix have been devised to offer a larger entrance to the passage of the spermatozoa. Fortunately, this is a thing of the past and now each patient who presents herself complaining of sterility is studied as to the peculiar cause. These causes may be grouped under six general headings:

(1) Defective production of spermatozoa.

(2) Obstruction or hostility in the male passages.

(3) Faults of delivery and reception.

(4) Hostile endocervical secretions.

(5) Tubal occlusion.

(6) Defective ovulation.

It is therefore apparent that in any case of primary sterility the male party to the contract must receive investigation prior to instituting or recommending any form of treatment for the female member. The potency of the male is best shown by the Hühner test (or the examination of the spermatozoa in situ following coitus). This is not only simple and efficient but it also gives a clue to the location of the trouble in the woman and the success of the particular coitus. *Man* may be credited with over 30 per cent of the primary sterilities resulting from underdevelopment, hypofunction, atrophy, epididymitis, prostatitis, change in vesicular secretions, malformations or impotence.

*In the woman*, endocervicitis takes first place. This lesion so changes the character of the cervical mucus that the spermatic elements of the male die of exhaustion before achieving their entrance to the uterine cavity. Tubal infection and its sequella make up the next largest group in the causes of barrenness; for inflammatory involvement of the tubes or peritubal tissues is not alone the result of gonorrheal invasion but is a common sequel of operations upon the cervix, labor and abortion. Fortunately, through study of the pathology of these lesions, we have learned to correlate the history with the living pathol-

ogy and so prognosticate to a certain degree what each form of infection will do. This is all-important in the treatment of sterility.

Those patients in whom live spermatozoa can be demonstrated within the cervical canal or in the uterus, yet who do not conceive, may have their lesion higher up in the uterus, endometrium, tubes or ovaries. In 1919, Rubin demonstrated that it was possible to insufflate the tubes accurately and safely with carbon-dioxide gas, and thus show their patency or impatency. With this fact ascertained, the function of the ovary and that elusive something which may be termed "sexual response" are the only other factors to be taken into consideration. The time of coitus and its relation to ovulation is now claiming considerable attention, for with the isolation of the sex hormone which Frank and Goldberger have recently demonstrated, it is possible to determine with accuracy whether or not the woman ovulates and the time at which ovulation takes place, even in the absence of menstruation. Hence, a properly timed coitus may result in impregnation. Ovarian hypofunction and low metabolic rates are frequently associated in the obese woman. Hypofunction of the ovary, unfortunately, is little understood. Cystic changes cause atresia of the follicles. Atrophy is often the result of prolonged septic infection; such an ovary may be seen without a single follicle or corpus luteum on the surface. The large white ovary with thickened capsule, the result of chronic circulatory stasis which is usually found low in the pelvis, has, in our experience, the greatest chances for developing an ovum which may become impregnated. Hence, it will be seen that more careful study of the physiological acts of the elements and organs taking part in conception has placed the treatment of sterility on a more rational basis.

#### RETROVERSION

Retroversion associated with retroflexion and some degree of descensus which always

coexists is most commonly an acquired condition, for even if the original retroversion was congenital, the partial torsion or twist in the pelvic veins will so engorge the uterus that if continued for a long enough time a pathological condition due to circulatory stasis in all of the pelvic organs must be established. The blood supply of the pelvis was apparently developed as a protection against infection, a definite line of defense, for while it is luxuriant and the muscular contraction of the uterus propels the blood, there is only one valve in the entire venous circulation of the pelvis; hence, subinvolution and retrodisplacement will naturally add to this circulatory stasis and produce a permanent pathology in the organs, tissues and blood-vessel walls. It is, therefore, my belief that the development of an acquired retroversion with descensus or the exaggeration of a congenital backward displacement is a gradual but progressive process which always develops a chain of complications directly attributable to the interference with the venous circulation and faulty uterine drainage, which in turn, produces change in the pelvic tissues in the form of edema, hypertrophy and cell proliferation. Therefore, we teach and practice correction and retention of retrodisplacement. Congenital retroversion in virgins or in newly married women, producing no symptoms, needs no local treatment. Special attention, however, should be given to the care of the rectum and pelvic colon in these women as fecal stasis is a common cause of pelvic complications.

At the present writing there are more than one hundred different operations and different modifications of original procedures on the round, broad and uterosacral ligaments, which are being practiced by the general and special surgeon for the cure of retroversion, with most disappointing end-results. Congenital displacements or those congenital versions to which acquired flexions have been added are by far the most difficult to cure, for so much depends on the degree of six factors:



- (1) Cervical invagination.
- (2) The position of the cervix and its relation to the vaginal axis.
- (3) The length of the uterosacral ligaments.
- (4) The inclination of the brim of the pelvis.
- (5) The depth and inclination of the symphysis.
- (6) The strength and development of the round ligaments.

When the accomplishment of a result depends upon the study and appreciation of so many different factors, is it a wonder that we err in the selection of type of procedures, or in the details of technique? The operation for the particular case must be a "Mrs. Jones" operation, or a "Mrs. Smith" operation, not a routine surgical procedure applied to different anatomical conditions. Probably, with the exception of the curette or stem pessary, no one gynecological condition has caused more unnecessary surgery and all that this means in morbidity, sequellae and mortality, than have the many operations for retrodisplacement.

There is an instrument known in history as a pessary (long since forgotten) which has many virtues that are unappreciated by our surgical friends. A pessary will cure an acquired retroversion if the uterus can be completely repositioned and if there is sufficient muscular structure in the pelvic floor to hold the pessary in place. *The pessary does not correct a retroversion* but retains the repositioned organ in anteversion after the uterine misplacement has been manually or posturally corrected. It anteverts and raises the uterus in the pelvis by raising the upper part of the posterior vaginal wall which makes upward and backward traction on the cervix. In the mechanics of the pessary, the posterior vaginal wall runs over the posterior or upper bar of the pessary as a pulley and draws the cervix upward and backward, while the anterior bar takes its purchase and rests on the pubic shelf behind the pubis, being retained in this position by

the pelvic floor. In this way the pessary acts as scaffold in supporting the anterior vaginal wall.

If proper care were given the woman at her confinement, or at the time of her abortion and during the post-partum and post-abortal periods, over 80 per cent of the retroversions going about the country, falling into the hands of operating surgeons, competent or incompetent, could be cured by palliative measures. Prior to 1910, in our follow-up clinic, the incidence of backward displacements occurring in women who were discharged from the hospital on the fourteenth day with a uterus in anteflexion or anteflexed retroposition was 38 per cent.

In 1910 we began our post-partum studies by establishing a post-partum clinic. Each patient before leaving the hospital was instructed to assume the knee-chest position night and morning and was taught the "monkey trot" (walking on all fours). She was also told to return to the clinic *one month* from her discharge from the hospital. If at this visit the uterus was retroverted, it was repositioned and a properly fitting pessary adjusted to retain it in anteversion. The patient was then instructed in the care of the pessary; with a result that at the end of three months only 2 per cent of our cases had uncorrected retrodisplacements.

Fewer and fewer operations for this condition are being done during the child-bearing period.

These remarks upon the advantages of the pessary would not be complete without mention of the contraindications. A pessary is contraindicated when any of the following conditions is present:

- (1) A large relaxed introitus without sufficient muscular structure in the pelvic floor to hold a pessary in place.
- (2) Lacerations of the cervix with the hyperplastic change and parametric inflammation in the base of the broad ligaments or in the uterosacral ligaments.
- (3) Inflammation of the pelvic peritoneum.

(4) In the presence of prolapsed tender ovaries.

(5) In the presence of posterior uterine adhesions limiting the mobility of the uterus.

All parametric, peritoneal and tubo-ovarian inflammation must be quiescent and all exudative processes completely absorbed before a pessary can be employed. The requirements imply the necessity of preliminary local treatment in the form of posture, douches, boroglyceride packs, and above all *time*.

#### CANCER

Cancer of the cervix and uterine body has been the subject of extensive study for many years; and while we must admit that the etiology is still unknown, certain clinical facts regarding the life history of cancer are accepted and make up today our basis for treatment:

(1) Long-continued irritation and chronic inflammation are conditions which pave the way for the development of new cell formation. Hence, ectropion and erosion predispose to cancer.

(2) Cancer begins as a local disease appearing as a small hard, indurated nodule on either cervical lip and develops as the inverting or everting type.

(3) Extension is either by continuity along the adjacent mucosa or by extension along the lines of lymphatic drainage.

(4) The earliest symptoms of cancer, i.e., the change in character of the leucorrheal discharge and metrorrhagia, occur as a result of tissue necrosis, and therefore are not present in the incipient changes.

(5) Cancer in its incipency, i.e., when it exists as a nodule or ulcer wholly within the confines of the cervix, is *curable* by

destruction or ablation—admitting the truths of these observations.

The preventive treatment is the repair of cervical injuries and the education of our women in the necessity of periodical pelvic examinations by competent observers. All questions of doubt must be settled by microscopic examination of the biopsy specimen (removed with a keen knife and sealed with the cautery). Only Group I cases of cancer in its incipient stage can be cured. Two methods of attack are admissible in present-day practice:

(1) Massive doses of radium with blocking of the parametrial lymphatics by deep roentgen-ray therapy.

(2) Radical operation removing the uterus, cervix and adnexa with the upper portion of the vagina and parametria.

In all cases where the growth has extended beyond the confines of the cervix, radium is the agent of choice. In cancer of the body, radical extirpation preceded by massive radiation has given the best results.

#### SUMMARY

To conclude, I may summarize the trend of gynecology today, as follows:

(1) It is in the direction of a better understanding of the basic pathology.

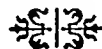
(2) All of our therapy is based upon this underlying principle.

(3) The trained surgeon has a greater respect for the physiological processes known as nature's defensive barriers.

(4) Fewer operations are being done for the correction of obstetric errors.

(5) All operations are being preceded by intelligent preoperative preparation.

(6) Operation for cancer is done only in selected cases.



# A CONSIDERATION OF CERTAIN GYNECOLOGIC PROCEDURES

FROM THE STANDPOINT OF CONSERVATISM

C. JEFF MILLER, M.D., F.A.C.S.

NEW ORLEANS

THE safety of anesthesia and the refinements of surgical technique, which we are wont to regard as among the chief blessings of the modern era of medicine, carry with them inevitable penalties. The very simplicity with which a laparotomy can be performed today is a potential source of danger. Because the mortality which follows the average surgical procedure is no longer such as to make one hesitate before he resorts to the knife, there is a tendency on the part of many to feel that the niceties of diagnosis are no longer as essential as they once were, and that the indications for surgery need not be so clear cut. Gynecology shares in this very doubtful tendency, and it is becoming unfortunately rather general to regard it as almost exclusively a surgical specialty, and to forget that many times simpler measures are quite as effective, and considerably safer for the patient.

Conservatism, however, is an entirely relative term. Speaking categorically, the preservation of structure and function is always to be preferred to their destruction, but mere abstinence from surgery is not necessarily conservative. Indeed, I have seen cases in which the apparently simple application of radium, even without anesthesia, was considerably more radical than a complete hysterectomy would have been.

The main error lies in the assumption that because a certain pathology is present, a certain procedure must inevitably follow. Thus a fibroid presupposes a hysterectomy, just as a retroversion presupposes a suspension. Such a mechanical standardized way of thinking is disastrous for the patient. True conservatism is only possible

when each patient is individualized, when not only the pathology present is considered, but also its degree and its duration, and whenever such non-medical factors as the age, the social condition and the financial status are also weighed and balanced.

It is well to remember, too, that any induction of anesthesia, any operation, even the most minor, carries with it a perfectly definite morbidity and mortality, which increase in direct proportion to the extent of surgery done. It is comforting to reflect that the mortality of hysterectomy, for instance, is not more than 2 per cent (though the qualification that this is so only in the best clinics is too frequently forgotten) but the law of averages is of small assistance unless we remember that each individual shares in its composition, and that he is quite as likely to figure in the debit column of deaths as in the credit column of recoveries.

Just as cesarean section has become the most abused operation in obstetrics, so has hysterectomy become the most abused operation in gynecology, and for exactly the same reason, its ease of performance and its brilliant end-results—provided all goes well. Naturally it is definitely indicated under certain circumstances, but it is not a cure-all for every type of pelvic disease, and it is no more logical to perform it routinely for pelvic pathology than it would be to amputate the hand for a broken bone.

Hysterectomy for uterine bleeding, for instance, is seldom warranted today unless actual uterine pathology is present. In the first place, such bleeding is as often due to extrauterine as to intrauterine

conditions. Constitutional diseases, adnexal pathology, general debility and lowered resistance, and endocrine dysfunction all, in the light of modern knowledge, play an important part in the production of uterine hemorrhage, and it is well to be certain that none of these is responsible before the uterus, which is often merely responding to the evil stimulus of disease elsewhere, is removed. Likewise one cannot be too careful to eliminate pregnancy as a possible source. Few things are more humiliating than to perform a hysterectomy and to find an unsuspected early pregnancy, or a threatened or incomplete abortion. In studying a large series of cases it is surprising to note how often this happens, and how often the uterus is entirely negative or exhibits merely a fibrosis or hyperplasia.

The use of the curette as a diagnostic measure, followed by frozen sections, cannot be too highly recommended as a routine procedure before hysterectomy is done for any hemorrhagic uterine condition. Occasionally it is curative. If it is not, and the bleeding persists, radium is practically a specific for fibrosis, chronic metritis, uterine hyperplasia and uterine insufficiency in women advanced in years, and even in young women and in girls it may be used in graduated doses to produce a temporary amenorrhea. As Howard Kelly long ago pointed out, it is notoriously difficult to stop menstruation in early life, even when you want to, and the advocates of hysterectomy for these benign conditions certainly possess no magic by which they can perform hysterectomy and at the same time preserve function.

Again, the mere presence of a fibroid does not mean that any treatment at all is necessary, let alone hysterectomy. A symptomless tumor, discovered accidentally in the course of an examination, needs only routine observation. Even fibroids which are causing symptoms do not necessarily demand hysterectomy, and the possibilities of myomectomy and irradiation should always be weighed before it is proposed.

Myomectomy is an operation whose field will always be strictly limited, but it can be used more often than is generally supposed, especially in private practice. During a limited period in my private work in which I performed 40 hysterectomies, 24 of them for fibroids, I was surprised to find from my records that I had done 26 myomectomies. On my service at Charity Hospital, however, during the same period, there was but one patient in whom the procedure was possible.

Myomectomy is best adapted to the single subperitoneal tumor, though multiple tumors of all types may thus be removed, providing that the uterine musculature is not too seriously damaged by the existing pathology or the surgery necessary to enucleate the growths. Since the whole point of the operation is the preservation of function, it is seldom indicated after the menopause, or when pelvic disease makes it necessary to remove the adnexa also. In competent hands the morbidity and mortality are no higher than they are for hysterectomy, and the results, from the angle of preservation of function, are excellent. More than 90 per cent of the patients menstruate normally thereafter, only a minimal number of the tumors recur with symptoms, and there are from 20 to 30 per cent of subsequent pregnancies. The latter is a particularly good record if we consider the various factors which enter into the question of sterility, aside from the undoubted fact that many of these women frankly do not want children.

Irradiation has a decidedly limited field. Since it most often means the destruction of function, it is seldom the procedure of choice in women under thirty-eight or forty if any measure short of hysterectomy will accomplish the desired results. In women beyond that age it is the ideal treatment in selected cases of interstitial myomata of moderate size, either single or multiple, in which bleeding is the chief symptom. Both tubal and ovarian disease must be eliminated, and it must be clearly ascertained that the growth is not under-

going degenerative changes. In any case which meets these conditions, however, one is usually safe in saying that radium is indicated and that hysterectomy would be an unwarranted procedure.

There is at least one exception to the foregoing remarks. Hysterectomy is the wisest procedure, even in young women, in fibroids when myomectomy is not possible, or in intractable menorrhagia or dysmenorrhea. From the standpoint of function irradiation is quite as irrevocable a procedure as hysterectomy, and it may give rise to very much more serious consequences than will follow the surgical ablation of the uterus and the preservation of functioning ovaries.

Routine removal of the ovaries after hysterectomy cannot be too strongly condemned. I am aware that the final facts are still in dispute as to the fate of the ovaries after hysterectomy, but my own experience, which is verified by that of other observers, is that their preservation is always warranted if they are not definitely diseased. It is beyond question that the violent symptoms and even the occasional nervous unbalance which may follow an abruptly produced artificial menopause are modified, and that the symptomatology of the delayed menopause, when it does occur, compares very favorably with that of the normal menopause.

As a general rule, the uterus should always be preserved unless there is some intrinsic reason for its removal. It may be a functionless organ after bilateral salpingectomy, for instance, in that conception cannot occur, but if the ovaries can be preserved and menstruation is still possible, the psychic effect, at least, would warrant its conservation. Naturally if the adnexa must be removed in toto, or if the uterus itself is diseased or is so denuded during operation that it would be virtually a useless organ, these arguments do not hold.

Hysterectomy for hydatidiform mole is an unwarranted and illogical procedure. Fifty per cent of all cases of chorioepithe-

lioma do follow moles but this type of malignancy is extremely rare, and the reverse of the statement, although it is often advanced as a fact, is by no means true, for 50 per cent of hydatidiform moles do not develop into chorioepitheliomata. Routine, careful observation is obviously indicated, and diagnostic curettage should be done promptly if symptoms recur, but radical surgery as an initial procedure has no justification whatsoever.

Diseases of the cervix are often handled by measures far too extreme. The proper time to treat cervical injuries is just after they occur, that is, when they are detected in the final examination which should always be made from ten to twelve weeks after delivery. At that time even moderate tears, with the accompanying erosion and eversion, may be successfully handled by the electrocautery, either in the office, or, if necessary, in the hospital under anesthesia, and the employment of this simple measure will in most cases avert what might develop into an intractable endocervicitis with its train of major and minor sequelae. Extensive tears should be promptly repaired surgically, without regard to the baseless tradition that plastic surgery should not be done in women in the childbearing years.

Moreover, even when treatment has been delayed and the cervix is apparently so diseased that only amputation is possible, a preliminary course of treatment will often change the entire aspect of the case. Rest in bed, hot douches, postural exercises, local applications, even cauterization and puncture of cysts will frequently so restore the parts to normal that less radical measures, such as trachelorrhaphy or the Sturmdorf or Schroeder operation, will be found perfectly feasible. Amputation of the cervix is always a radical measure, and the end-results in young women particularly are so generally unsatisfactory that it should be an exceptional and not a routine treatment for cervical disease.

It is beyond question that occasionally

retroversions of the uterus are symptomless and that their correction falls therefore into the class of unnecessary surgery; but in the majority of cases this is not so and some treatment is warranted. It does not follow, however, that it need be surgical. Retroversions which are detected shortly after delivery may often be corrected by the application of a Smith or a Hodge pessary, and this simple measure certainly deserves a trial before operation is resorted to. It is well to remember, too, that because backache is associated with retroversion, it does not necessarily follow that it is due to it. Arthritis, neuritis, kidney disease, sacroiliac strain, traumatism, even bad posture, may all be responsible, and it is wise to eliminate them before the patient is promised relief by surgery. Likewise retroversions play only a minor part in sterility, and suspension operations performed solely for the relief of this condition are not usually justified by their results.

Immediate operation for tubal disease is in most instances radicalism of the most extreme type. Salpingitis is essentially an infectious disease, in which autosterilization takes place in the majority of cases, and in which spontaneous clinical recovery and even functional restoration are possible. Immediate operation, therefore, quite aside from the admitted risks of surgery in the face of an acute infection, obviously means that a certain number of unnecessary operations will be performed. In addition, surgery done at this time must usually be radical, since the involvement of the pelvic organs is general and localization has not occurred. Plastic operations on the tubes are only occasionally possible, and even then the end-results, from the point of view of function, are almost uniformly unsatisfactory. Also studies of a large series of cases operated on during the acute stage will show that radical removal of the adnexa and even hysterectomy are too generally done to warrant the advocates of this procedure pleading for it on the ground of conserving structure and function. Finally, the woman who

recovers clinically under expectant treatment, even though she does not conceive, is no more absolutely sterile than the woman whose tubes were removed at laparotomy during an acute attack. As a matter of fact, the percentage of subsequent pregnancies under expectant treatment is larger than is generally supposed; Holtz, for instance, has recently reported it to be 12 per cent in a series of more than 1000 cases of his own.

I have been interested also to note how invariably the morbidity and mortality after operation for tubal disease increase in proportion to the length of time the case is cooled. Thus in a series of 600 consecutive operations which I recently investigated from the records of Charity Hospital and Touro Infirmary, three-quarters of all postoperative complications were in uncooled cases, while the death-rate in them was more than 4 times as high as in the cooled cases. Since these 600 cases were done by 57 physicians, they are rather more representative than DuBose's series of 419 cases in which immediate operation was done. The death-rate of one in the latter group is extraordinary, but the entire series was done by one man, and an expert at that. The statistics I have quoted are not mere coincidence. They have been substantiated from other clinics and by other observers.

It is obvious from instances such as I have discussed—and they could easily be multiplied—that there are at least two very dangerous tendencies in gynecology today. One is the tendency to resort to surgery without a careful consideration of simpler non-surgical measures, which might give equally good results with less inconvenience and less risk, and to perform major surgery for minor conditions. The other is the promiscuous and causal removal of the female sexual apparatus on the most trivial indications. Since this is not ordinarily a procedure which endangers life, function is lost sight of, comfort is disregarded, sentiment is thrown to the winds, and unnecessary and multilating

radical surgery is done without a consideration of other more conservative modes of treatment. Howard Kelly was right when he said that surgery developing in the hands of men had dealt too lightly with mutilating operations in women, and that if the case might be reversed for several decades, with women operating and men suffering the mutilations, there

would be a large prepossession in favor of wise conservatism. At any rate, in gynecology, as elsewhere in medicine, the end-results will always be better if the patient be considered as an individual rather than as a lay figure on which to demonstrate machine-made diagnoses and standardized treatment, which too often involves also a display of surgical fireworks.



Priestley has described the history of gynecology hitherto as a series of "crazes," a tendency to follow prevailing fashions. The uterine displacement craze came first, with Hewitt in England, Velpeau in France, and Hodge in America championing the pessary for the treatment of backache or pelvic pain, and every gynecologist inventing or modifying one himself; the unfortunate uterus all the while was, as Allbutt says, either "impaled on a stem or perched on a twig." In 1857, Gustave Bernutz found a case of periuterine abscess due to inflammation of the pelvic cellular tissue,

and thence the pelvic cellulitis craze; on this Bernutz and Goupil published their famous memoir in 1862. Pelvic pathology was viewed largely from this vantage point until in 1880 Gaillard Thomas exploded it by showing that much so-called cellulitis is really peritonitis, and rare in virgins. Similarly, such conditions as oophorectomy, clitoridectomy, inflammation of the os and cervix uteri, excision of the uterus and its adnexa, operations for extrauterine pregnancy, and cesarean section all had their day, following the dictates of fashion.



# ECLAMPTIC TOXEMIAS AND INDICATIONS FOR TREATMENT

E. M. LAZARD, M.D., F.A.C.S.

LOS ANGELES

IT has often been said that before we may hope to have a rational treatment for eclampsia, we must first know its etiology and until that time, our treatment must of necessity be empiric.

## CLASSIFICATION OF ECLAMPTIC TOXEMIAS

Clinically, eclamptic toxemias may be divided into: (1) the true or hepatic type; (2) the nephritic type; (3) true eclampsia superimposed on an old subacute nephritis.

## ETIOLOGY

Eclampsia has been well termed "the disease of theories." Williams<sup>1</sup> after devoting 11 pages of his text book to discussing the etiology under twelve headings,\* sums up the entire subject with the statement: "It is apparent that the cause of eclampsia has not yet been discovered" and "Furthermore, it must be admitted that the treatment of the disease must remain empirical and unscientific so long as we are ignorant of its primary cause."

To me, the clinical fact which is now universally recognized, that the incidence of eclampsia in properly supervised cases in private practice and in well conducted prenatal clinics, has been reduced to an almost negligible minimum, is evidence that the search for a single specific cause for the fully developed eclampsia is destined to be a futile one. For, if such specific cause were effective in all cases of true eclampsia, how could we explain the almost complete disappearance of eclampsia in properly supervised cases, in the absence

of any known specific cause or specific remedy?

To my mind the symptom complex which we term eclampsia is a complex toxemia which originates in the pregnant condition and which successively involves the liver and kidneys. Thus to the original toxemia, there is added the toxemia of kidney and liver insufficiency and possibly absorption products of the degenerating liver, as well. In other words, there has been established a toxemic vicious circle.

Whether the original toxemia be due to absorption of fetal or placental elements into the maternal circulation, pressure on kidneys or ureters, an endocrine dysfunction, or whichever one of the many possible causes which have been advanced, or possibly some cause not yet suggested, I believe it to be a comparatively mild toxemia which, as a rule, requires some exciting or activating cause to produce the clinical picture of an eclamptic toxemia.

Of the exciting or activating causes there are (1) dietary; (2) local foci of infection; (3) acute infections.

## DIETARY

The reduction in the amount of animal proteids and fats in the diet of the population of Central Europe during the war was thought to be the cause of the marked reduction in the incidence of eclampsia by several investigators. (Quoted by Williams.) Eclamptic attacks not infrequently follow dietary indiscretions. Here we may find a possible explanation for some of the so-called intercurrent eclampsias which under sedative and eliminative treatment may go for from several days to several weeks without recurrence of the eclampsia to spontaneous delivery of a living child. One of the cases of intercurrent eclampsia

\* (1) Uremia (2) Bacterial origin (3) Autointoxication (4) Biological reactions (5) Entrance of fetal elements into the maternal circulation (6) Action of fetal metabolic products (7) Action of decomposition products of the placenta (8) Alterations of maternal metabolism (9) Endocrine disturbances (10) Mammary toxemia (11) Effects of dietary alterations (12) Physiochemical changes.

## Lazard—Eclamptic Toxemias

which we have already reported (Ref. 15, Case No. 47) was a Mexican woman, who was seven and one-half months pregnant, had gone into convulsions eleven hours before admission and had had constantly recurring convulsions all day; under the intravenous magnesium sulphate treatment the convulsions were controlled, the coma cleared and the patient was carried six weeks to the spontaneous delivery of a living child. This patient had no other treatment after the regulation of bowels and proper restriction of diet. It seems entirely probable that in this case the exciting factor in the development of the eclampsia was dietary and that the toxemia was cured by elimination and the recurrence of the eclampsia prevented by removal of the exciting factor, improper diet.

Local foci of infection such as in the teeth or tonsils may be the activating cause. Some writers have maintained that they have demonstrated pus foci in teeth by roentgen ray in practically all their cases of eclamptic toxemias. That diseased tonsils may be the exciting factor seems to be demonstrated by the following case reported to me by Dr. Johnson and Dr. Wiley. The patient developed eclampsia with the first pregnancy, and was delivered of a dead baby by accouchement forc . In her second pregnancy at the third month she showed evidences of a beginning toxemia, high blood-pressure and albuminuria. On examination, she was found to have badly diseased tonsils; a tonsillectomy was done; the toxemic symptoms cleared and the patient went on to delivery at term without any further evidence of toxemia.

In several cases of preeclamptic toxemia and of eclampsia, pyelitis and pyelonephritis seemed to be the responsible factors; the pyelitis acting not only as a local focus of infection but there was also direct involvement of the kidney function. Acute infections such as rhinitis, tracheitis and bronchitis may be the exciting

factors in producing an eclamptic toxemia. Such a case came under my observation in which a patient who had had 4 perfectly normal pregnancies, came down with an acute tracheobronchitis in the seventh month of her fifth pregnancy; two days after the onset of the acute infection, her blood-pressure rose to 170, albumen appeared in the urine and she complained of severe epigastric pain. The symptoms were controlled by intravenous magnesium sulphate treatment but as there was no marked improvement, labor was induced by the introduction of a bag. She had a premature separation of the placenta and was delivered of a dead premature fetus. The upper respiratory infection continued after delivery and she developed a frontal sinus infection. Eclampsia did not develop but the exciting factor in the production of the preeclamptic toxemia apparently was the acute upper respiratory infection.

As many patients present various local foci of infection or have acute infections, who do not develop eclamptic toxemias, it is necessary to assume that those who do, have some at present unknown etiological factor which is excited into activity by the local focus, acute infection or dietary indiscretion. With this conception of the etiology of true eclampsia, the marked reduction in the incidence of eclampsia in the properly supervised case can be explained, as the diet is carefully prescribed and local foci of infection are properly cared for; in other words, where as far as possible all exciting causes are eliminated.

The nephritic type of eclampsia is merely uremic convulsions of the pregnant. That an old nephritic who is just maintaining the balance of health in the non-pregnant condition is very likely to present an acute kidney insufficiency, uremia, under the added load of pregnancy is easily understood. While the etiology and prognosis is very different in this class of cases from that of true eclampsia, yet it is almost impossible to differentiate them in the attack itself.

The differential diagnosis is made by an accurate history showing an antecedent nephritic condition; there is usually an increase in the non-protein nitrogen in the blood; and by the ultimate outcome. In case of death, the autopsy in the pure nephritic case will show advanced kidney changes and little or no typical liver changes. In case of recovery from the uremic attack, the blood-pressure remains high and albuminuria persists; in true eclampsia, there is a comparatively rapid return to normal of the blood-pressure and of urinary findings. The nephritic cases are the ones which tend to recur in succeeding pregnancies, while the true eclamptics do not, as a rule, recur.

#### CAUSE OF DEATH IN ECLAMPSIA

Little attention has been paid to the immediate cause of death in eclampsia; most writers discuss statistics of series of cases and content themselves with statements of mortality percentages. If we are to arrive at a proper appraisal of the value of any treatment, we should take into consideration whether fatal damage has been done before the patient comes under treatment and whether the treatment will tend to prevent such damage from taking place if it has not already occurred.

The toxemia, *per se*, is seldom the immediate cause of death. Accidents during the convulsions and coma, such as cerebral apoplexy, aspiration pneumonia, acute cardiac decompensation with pulmonary edema and acute kidney-block, are the most frequent causes of death.

Over-treatment, especially surgical attack, has been not a small factor in mortality, as evidenced by all recent statistics. No competent surgeon would think of subjecting a patient as toxic as an eclamptic to a major surgical operation that was not absolutely imperative.

Yet many a competent and conscientious surgeon will unhesitatingly subject such a patient to a cesarean section and accept a mortality rate of from 30 to 50

per cent as inevitable and congratulate himself that he has saved the lives of the other 50 to 70 per cent.

The urologists have learned that the old toxic prostatic is not a good surgical risk and that their mortality rate is far better since they have been giving these toxic patients proper preoperative care and relieving them of their toxic load before making an operative attack on the ultimate cause of the toxemia, the enlarged prostate. Just so, the obstetricians have learned that the highly toxic eclamptic does far better if given proper medical care and in the majority of cases, nature will in due time remove the ultimate cause, the pregnancy, without the necessity of major operative intervention.

Medical treatment may be also overdone and the continual disturbing of patients for gastric lavages, colonic flushings, hypodermic medication, hot packs, phlebotomy, etc., may result in keeping the patient in a condition of constantly recurring convulsions, always with the danger of fatal accidents happening during the convulsive attack. This danger has been recognized by Stroganoff, who administers chloroform before any procedure, even a hypodermic injection, to prevent a convulsive seizure, and also by Williams, who objects to chloroform, but gives nitrous oxide gas for the same purpose.

#### TREATMENT

There is little difference of opinion as to the proper treatment of preeclamptic toxemia, or in other words, the prophylactic treatment of eclampsia. The indications are (1) to overcome the effects of the toxins on the nervous system by rest, quiet and the exhibition of sedatives; (2) to stimulate elimination of toxins by catharsis (preferably hydragogue cathartics, as magnesium sulphate), by diuresis, (pushing the intake of fluids) and by keeping the skin active; (3) to lessen the work of the embarrassed emunctory organs, especially the kidneys, by proper restriction of diet, cutting the protein food down

as much as possible and making the diet salt free. These measures will usually suffice to carry the patient to term without the occurrence of an eclamptic attack.

In addition to the above outlined treatment for the preeclamptic, we have, for the past three years, been giving magnesium sulphate intravenously in an attempt to prevent the development of eclampsia. I will refer to this again in discussing the magnesium sulphate treatment.

Where the patient becomes progressively worse in spite of proper care, it may be necessary to terminate pregnancy by the method best suited to the individual case, before the occurrence of convulsions.

This is more often necessary in the nephritic toxemias with impending uremia than in the true eclampsias.

Markedly contrasted with the unanimity of opinion and practice in the treatment of the so-called preeclamptic toxemia is the wide diversity of opinion and practice, amounting almost to chaos, which has prevailed in the past twenty years as to the proper treatment of the ultimate expression of that toxemia, eclampsia. Up to thirty years ago, before the present surgical era, the treatment was almost entirely medical. The results were so poor that it was but natural that with the development of surgical work, surgery should be turned to. As there is no question but that the pregnancy is the ultimate cause of eclampsia and as it was noted that the convulsions in the greater percentage of cases stopped after the delivery, it was only logical to direct the surgical attack against the pregnancy. Accouchement forcé, cesarean section, vaginal hysterotomy (so-called vaginal cesarean section) version and forcep delivery have all been practiced; the last two methods being applicable only where labor was in progress and the os either dilated or dilatable.

It is noteworthy, that the mortality-rate progressively diminishes, the nearer the patient is to the completion of the labor

when the intervention is undertaken; being lowest for those in which spontaneous delivery occurs and highest for accouchement forcé and cesarean section. The results of active intervention left much to be desired as mortality rates remained high, from 25 per cent to 40 per cent.

Surgical attack was not limited to termination of the pregnancy but some bolder operators attempted to relieve the condition by operating for some of the effects of the toxemia which they deemed the most effective in bringing about the eclamptic state. Thus, Edebohls<sup>2</sup> practiced double decapsulation of the kidneys for acute urinary suppression in eclampsia; Zangemeister suggested and actually performed skull trephining to relieve the intracranial pressure, but Kosmak<sup>3</sup> remarks "his good results were not confirmed by others." Zangemeister also proposed hysterectomy, considering anomalies of the placental function as a cause of eclampsia and Sellheim proposed amputation of the breasts on the basis of the mammary theory of the cause of eclampsia (referred to by Kosmak<sup>4</sup>). Fortunately, these rather extreme measures never became popular. The first 2 procedures, cranial decompression and kidney decompression, however, are based on sound reasoning, as it is now generally conceded that increased intracranial tension, due to edema of the brain, is the cause of the convulsions and coma; and acute urinary suppression is not infrequently present in the severe eclamptics. Both these conditions can usually be relieved by medical treatment without the danger and shock of such radical surgery.

#### MEDICAL TREATMENT

In the past few years, the medical treatment of eclampsia has again come into favor and the pendulum has now very definitely swung against radical operative procedures. The indications for treatment are very definite, viz., to antidote the effects of the toxins on the central nervous system, (1) to control the convulsions and

coma, thus minimizing the danger of fatal accidents, (2) to reduce to a minimum all sources of additional irritation, and (3) to stimulate the elimination of toxins.

In 1897, Stroganoff began the development of his treatment by profound narcosis; Tweedy of the Dublin Rotunda, limited his treatment to eliminative procedures. Both these authorities reported results far better than those obtained by radical surgical methods, Stroganoff reporting a series of 2208 cases with a mortality of only 9.8 per cent.<sup>5</sup>

It is unnecessary to describe Stroganoff's method here as recent literature contains very extended descriptions and exact directions. In a critical review of Stroganoff's method, Stander,<sup>6</sup> while coming to the conclusion that as a whole Stroganoff's cases represented milder ones than those seen in other clinics, was very favorably impressed with it, and they have adopted it with some modifications in Williams clinic, at Johns Hopkins Hospital.

#### MAGNESIUM SULPHATE IN ECLAMPSIA

The use of magnesium sulphate by mouth as a hydragogue cathartic in the toxemias of pregnancy has had a recognized place for many years.

Since the work of Meltzer and Auer<sup>7</sup> in demonstrating the sedative and anti-convulsive effects of magnesium sulphate, there have been attempts to obtain these results in eclampsia. Thus Einar,<sup>8</sup> Rissman,<sup>9</sup> Guggisberg<sup>10</sup> and later Alton and Lincoln<sup>11</sup> used it intraspinally. Rectal, subcutaneous and intramuscular injections<sup>12, 13</sup> have all been practiced.

In February 1925, the writer<sup>14</sup> reported a series of 20 cases of eclampsia which were treated at the Los Angeles General Hospital by the intravenous injection of magnesium sulphate. The results were so impressive to us that although the series was small, we made a preliminary report in the hope that further experience would develop a treatment which would mark an advance in the treatment of this dread complication of pregnancy.

In, July, 1926,<sup>15</sup> together with Dr. Irwin and Dr. Vruwink, I made a report on a series of 100 cases which had received this treatment and which showed a corrected mortality of 9 per cent. We also included 45 preeclamptic cases in which intravenous magnesium sulphate was used as a prophylactic against the development of eclampsia.

When the intravenous use of magnesium sulphate was begun, it was with the idea of controlling the convulsions; and other recognized eliminative measures were used. The convulsions were controlled in every case and very soon it was noted that there were marked eliminative effects, as well. We have now practically abandoned all other adjuvant measures and depend on the intravenous magnesium sulphate for the treatment of the toxemia almost entirely. The effects which were obtained were explained by anti-convulsive action and dehydrating effects of the intravenous magnesium sulphate. Edema rapidly disappeared and diuresis markedly increased.

The reduction of the edema of the brain brought about a comparatively rapid clearing up of the coma. Decrease of the blood-pressure was also noted.

Since my preliminary report, 2 articles have appeared in the literature which have an important bearing on this subject. In the first, Mussey<sup>16</sup> of the Mayo Clinic discusses the clinical similarity between eclamptic toxemia and acute glomerular nephritis. After quoting Keith and Volhard's statement of the similarity of the symptoms of trench or war nephritis to certain phases of the toxemias of later months of pregnancy, Mussey reviews 11 personal cases of eclampsia and preeclamptic toxemia and concludes "The symptom complex of preeclamptic toxemia is often identical in clinical symptoms and renal function with that of acute glomerular nephritis." In the second article, Blackfan and Hamilton of Harvard<sup>17</sup> report their use of magnesium sulphate intravenously (150-200 c.c. of 1 per cent solution) in the uremia of acute glomerular nephritis in children. They

claim a reduction of blood-pressure from the intravenous injection and ascribe it to a reduction of intracranial pressure by a relief of the cerebral edema. Their first 5 conclusions can be applied practically without the change of a word to eclampsia. They are: 1. "The form of uremia seen in acute glomerular nephritis in children [eclampsia] is characterized by headache, vomiting, visual disturbances, delirium or coma and convulsions. 2. It is always preceded by a steady rise in arterial tension and by a visible but not necessarily marked edema. A steady increase of arterial tension is the most reliable indication of approaching uremia [eclampsia]. 3. Intracranial tension resulting from edema of the brain is probably the causative factor of the symptoms in this form of uremia [eclampsia]. This is suggested by finding an edematous brain at autopsy and the relief afforded by treatment favoring a decrease of cerebral edema. 4. Arterial hypertension is probably the result of increased intracranial pressure. 5. The intravenous injection of 1 per cent solution of magnesium sulphate [10 per cent solution in eclampsia] together with the administration of the salt by mouth and by rectum has been found effective in the treatment of this form of uremia [eclampsia]."

We have regularly noted a rapid increase in the urinary output after this intravenous medication. Thus by this simple medical procedure the results sought by Edebohls with his renal decapsulation and by Zangemeister with his trephining for cerebral decompression, are obtained without subjecting these severely toxic cases to the dangers of severe surgical attack.

With this one procedure, the therapeutic indications in eclampsia are fulfilled, viz., control of convulsions, sedation, and elimination.

#### INDICATIONS FOR SURGICAL INTERFERENCE IN ECLAMPSIA

In pre-eclamptic toxemias which do not respond to treatment, induction of pre-

mature labor is the operation of choice. *Cesarean section is indicated only in those cases where obstetric conditions are such as to indicate its performance irrespective of the toxemia.* The eclamptic should not be subjected to any surgical interference unless she be in active labor and then only where the labor is not progressing satisfactorily and interference is indicated in the interest of the child or to relieve the mother of an additional source of irritation. A study of the case reports now at hand, leads to the conclusion that the shock of such surgical interference is greatly lessened if the patient is under the sedative effects of the intravenous magnesium sulphate. Such surgical interference should be limited to forcep extraction or podalic version and extraction after complete dilatation of os; *Cesarean section in the eclamptic in labor is absolutely contraindicated, except where the obstetric conditions are such as to make its indication absolute.*

The routine at present followed at the Los Angeles General Hospital is as follows:

#### PRE-ECLAMPTIC CASES

1. Usual sedative and eliminative treatment and dietary regulation.
2. Blood-pressure 150 systolic, or higher, 20 c.c.  $MgSO_4$  10 per cent intravenously; blood-pressure to be taken twice daily, and intravenous magnesium sulphate repeated if blood-pressure does not come down.
3. Surgical interruption of pregnancy only to be done with the consent of senior attending obstetrician.

#### ECLAMPSIA

1. Twenty c.c. 10 per cent solution  $MgSO_4$ , intravenously as soon after first convulsion as possible.
2. Repeat injection of  $MgSO_4$  every hour until convulsions are controlled (attending obstetrician to be notified if convulsions are not controlled within three hours).
3. Blood-pressure to be taken every

hour after convulsions are controlled and if it begins to rise, again nearing its height at time of convulsion, repeat  $MgSO_4$ ; also repeat if convulsions recur.

4. If patient is comatose, or very restless in a semi-comatose delirium and blood-pressure is falling, give choral gr. xx and NaBr gr. lx per rectum.

5. All patients to be prepared for delivery as soon as they are quiet enough to do so.

6. Utmost quiet to be observed and nurse to be constantly with patient, until coma has cleared.

7. Oxygen inhalations after each convulsion until breathing is normal.

8. If patient is in labor, nitrous oxide for pains.

9. If in second stage labor and proper progress is not being made, low forceps extraction or version may be done with consent of attending obstetrician.

10. *Cesarean section only to be done for absolute obstetric indications and with consent of senior attending obstetrician.*

Variations from the above routine only to be made on direction of the attending obstetrician.

#### CONCLUSIONS

1. Eclamptic toxemia is a complex toxemia, whose ultimate expression (eclamptic convulsions and coma) closely simulates the clinical picture of the uremia of acute glomerular nephritis.

2. As a medical complication of pregnancy, its treatment should be principally medical.

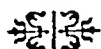
3. The intravenous magnesium sulphate treatment fulfills the important medical indications, viz., control of convulsions, sedation and elimination.

4. Surgical interruption of pregnancy may be necessary but in the acute antepartal case should be delayed until the active eclampsia is controlled.

5. In the intrapartal case, the type of interference should be determined by the obstetric conditions, irrespective of the eclampsia.

#### REFERENCES

1. WILLIAMS, J. W. *Obstetrics*. 1923, 609-620.
2. EDEBOHLS, G. B. *N. Y. Med. J.* 1903, lxxvii, 1022-1024. Referred to by Kosmak, *Toxemias of Pregnancy*, 1922.
3. KOSMAK, G. W. *Toxemias of Pregnancy*. 1922, 131.
4. KOSMAK, G. W. *Idem.*, p. 134.
5. WILLIAMS, J. W. *Obstetrics*. 1923, 626.
6. STANDER, H. J. *Treatment of Eclampsia by the Stroganoff Method. Am. J. Obst. & Gynec.*, 1925, ix, 327-338.
7. MELTZER and AUER. *Am. J. Physiol.*, 1905, xiv, 366-388; *Med. Rec.*, 1905.
8. EINAR, H. *Zentralbl. f. Gynäk.*, 1907, xxxi, 1125. Referred to by Alton and Lincoln. *Am. J. Obst. & Gynec.*, 1925, ix, 11.
9. RISSMAN, *Ztschr. F. Geburtsb u. Gynäk.*, 1915-16, lxxvii, 477-453. Referred to by Alton and Lincoln.
10. GUGGIBERG. *Zentralbl. f. Gynäk.*, 1913, xxxvii, 369-373. Referred to by Alton and Lincoln.
11. ALTON, B. H., and LINCOLN, G. C. *The Control of Eclampsia Convulsions by Intraspinal Injections of Magnesium Sulphate. Am. J. Obst. & Gynec.*, 1925, ix, 167-177.
12. CLEMENT, R. *Le Sulfate de Magnésie dans le traitement de L'Eclampsie Puerpérale. Presse méd.*, 1925, xxxiii, 646.
13. DORSETT, L. *The Intramuscular Injection of  $MgSO_4$  for Control of Convulsions of Eclampsia. Am. J. Obst. & Gynec.*, 1926, xi, 227-231.
14. LAZARD, E. M. *A Preliminary Report on the Intravenous Use of Magnesium Sulphate in Puerperal Eclampsia. Am. J. Obst. & Gynec.*, 1925, ix, 178-188.
15. LAZARD, E. M., IRWIN, J. C., and VRUWINK, J. *Intravenous Magnesium Sulphate Treatment of Eclampsia, Collective report of 142 cases. Am. J. Obst. & Gynec.*, 1926, xii, 104-112.
16. MUSSEY, R. D. *Clinical Similarity between Eclamptic Toxemia and Acute Glomerular Nephritis. Am. J. Obst. & Gynec.*, 1925, ix, 808-819.
17. BLACKFAN, K. D., and HAMILTON, B. *Uremia in Acute Glomerular Nephritis. Boston M. & S. J.*, 1925, clxiii, 617-619.





# THE KIDNEY IN ECLAMPSIA

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ST. LOUIS

ALTHOUGH for a long time the kidney, in cases of eclampsia, has been described as showing marked pathological changes some of which might be considered as being more or less characteristic, it has not been until the recent publications of Fahr that the picture of the kidney in eclampsia has been put clearly before us. Fahr definitely recognizes the work of previous writers, and has found in some of his own cases changes such as they describe; but he emphasizes certain lesions which he has found more consistently and which he regards as more important than the earlier described changes. These lesions have in most instances been entirely overlooked by the older writers, or if mentioned in part they were not considered important, and apparently were not understood.

Since at the time of this writing I have just finished studying personally Professor Fahr's material in Hamburg, and as, to my knowledge, his findings have not been discussed in the English and American literature, I thought it might be of interest to describe briefly these findings for the obstetrical and gynecological symposium number of this journal. In describing the findings of Fahr it may also be of interest to mention the rare but severe forms of kidney necrosis reported chiefly by the Glasgow school, and their material which I was privileged to study. Professor Fahr very kindly put his material at my disposal and suggested my use of such illustrations of his as seemed necessary.

For the several cases of cortical necrosis of the kidney, data from which are also presented in this paper, I am indebted to Dr. J. N. Cruickshank, pathologist to the Royal Maternity Hospital at Glasgow, Scotland. I had the pleasure of meeting Dr. Cruickshank in Glasgow, where he personally demonstrated his cases to me. It

seemed that by studying these severer cases along with the more characteristic and usual findings of Fahr, I might be able to gain some information as to the occurrence of these rare forms. Therefore, at the outset, I wish to express my thanks and deep appreciation to Professor Fahr and Dr. Cruickshank for the use of their very valuable material.

In bringing out the points emphasized by Fahr, I have held very closely to his own descriptions, and with the exception of a few points that have occurred to me in the work, there is nothing original in this article.

In Fahr's most recent publication concerning the pathological lesions of the kidney, he describes the eclamptic kidney under the heading of definite characteristic nephroses, such as lipoid and amyloid nephroses, because the eclamptic kidney has to some degree a similarity to these kidneys. However, he emphasizes clearly that there are findings in the eclamptic kidney which are not found in these types of nephroses, but are definitely characteristic of the eclamptic kidney, and therefore it must be classified separately. This he has done by placing it under the heading, "Schwangerschaftsnephrose, Eklampsieniere."

Lubarsch in 1896 described the eclamptic kidney changes in 3 stages: he apparently was dealing with more marked cases than the usual material, and as Fahr stated there were no cases which could be put in Lubarsch's Group 2 or Group 3. In the first class, Lubarsch places those cases which macroscopically appear pale, gray or light yellow in color, and which microscopically show slight fatty changes in the convoluted tubules or coagulation necrosis with fat emboli in the glomerular loops and fatty changes in the glomerular epithe-

lium; in the blood vessels, hyaline and blood platelet thrombi, with no evidence of inflammation. In the second class, one can see definite superficial hemorrhages in varying numbers; in these cases the coagulation necrosis of the epithelium is more marked, also without any evidence of inflammation. The occlusion of the vessels with thrombi is more marked and more general than in the first class. In the third class, development of infarcts with hemorrhages takes place, and the kidney is

The changes which Fahr has emphasized as usual and which can readily be substantiated by the study of his or similar material, as I can definitely state, consist in order of their constancy and degree as follows:

1. The swelling of the glomerular loops.
2. The albuminous degeneration of the convoluted tubules.
3. Hemoglobin cylinders.
4. Degenerative changes in the arterioles: arteriolitis, vas afferens.



FIG. 1. Eclamptic kidney showing characteristic glomeruli with albuminous degeneration of the convoluted tubules. Note that the glomeruli are large, fill out the capsule completely, are devoid of blood and that the nuclei appear decreased in number.

involved with anemic infarcts and hemorrhages, where inflammatory reactions can be seen in the neighborhood of the small infarcts. In the material of Fahr the above changes played no marked rôle, while the severe cases of cortical necrosis with thrombosis are definitely the type of case that Lubarsch placed in his third class. In one of the cases of kidney necrosis I was able to see, in areas not involved with necrosis, findings in the glomeruli entirely similar to the typical findings of Fahr; and in all probability the usual and common findings of Fahr are forerunners of these more marked changes.

5. Thrombi in the glomerular loops.

The changes in the glomeruli are of chief interest and seem to play the greatest part in the kidney lesions. These changes in the glomerulus consist of a widening and swelling of the capillary wall, which may vary considerably in degree. In some instances the changes are slight, but can be so marked that the glomerular loops appear as masses run together in a cloudy and clubbed manner with a disappearance of the nuclei and of the cell outlines. There is no evidence of increase in nuclei as in acute glomerular nephritis. In fact, the nuclei appear as diminished

in number with considerable evidences of degeneration, chiefly noted by differences in size and shape. The glomerular loops appear devoid of blood, due to the narrowing of the lumen as a result of the swelling of the capillary wall. Hyaline changes occur; this has been mentioned previously by Schmorl without placing the proper stress on its relations. One also finds in some instances, as Leyden has emphasized, fat deposits, which are at times so fine that they are scarcely noticeable, but in

field are all involved and are set among convoluted tubules, which show marked albuminous degeneration. Figure 2 shows this degeneration very clearly and brings out more strikingly the usual appearance of the glomerulus. To bring out the contrast between the glomerular lesion in eclampsia and that in other conditions, we compared the lesion to the glomerulus in a case of simple nephrosis and to one in a case of acute glomerular nephritis. In simple nephrosis, the glomerulus is practi-

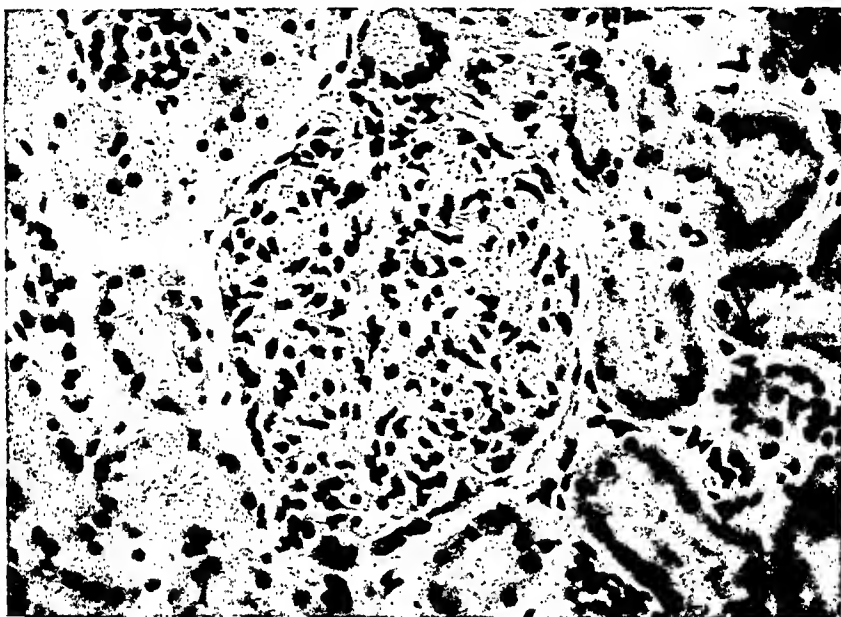


FIG. 2. High power of Figure 1; shows the albuminous degeneration of the tubules to good advantage. Note that the individual glomerular loops are not apparent, the nuclei far apart and no capillaries are seen.

occasional loops can be quite pronounced. Hyaline thrombi are seen from time to time and were quite marked in several cases, particularly one which Fahr has described as Case XIII in his article in "Hinselmann's Eklampsie." The thrombi are readily seen on account the bright appearance and are rose red in color and stand out clearly against the pale dull changed glomerulus. The characteristic appearance of the glomerulus is well shown in Figures 1 and 2. In the low power picture one can readily see how the glomerulus is swollen, practically filling out the entire capsule and appearing entirely bloodless. The glomeruli in the

cally normal, the loops being distinct and definitely filled with blood. Our illustration of such a glomerulus was poor, and rather than produce confusion, it was omitted. In Figures 3 and 4 we have glomeruli from cases of eclampsia and acute glomerular nephritis; in the first case we see the loops, swollen, clubbed and hyaline in appearance with a definite scarcity of nuclei, while in the second case there is a marked increase in nuclei in glomeruli of increased size. This nuclear increase is due to the proliferation of the endothelial cells, which fill up the lumina of the capillary loops, causing a diminished flow of blood through the glomerulus. The contrast

between these two conditions is very striking, clearly showing that they have nothing in common. Fahr feels that the degree of glomerular change does not necessarily keep pace with the clinical picture, and mentions the cases of eclampsia without convulsions as reported by Schmorl, which also show these glomerular changes, as Fahr has further substantiated.

An important point which must be kept in mind if these changes are to be best demonstrated is that the fixing and

albuminous degeneration which can advance to the stage of hyaline drop degeneration, along with more or less fatty change, the fatty material showing as a rule no evidence of being doubly refractive. Necrosis of the tubules was not seen in Fahr's material in any noticeable degree, and therefore is not regarded by him as one of the frequent findings.

Vessel changes, particularly in the vessels of larger size, as the interlobular arteries or larger, show no great change,

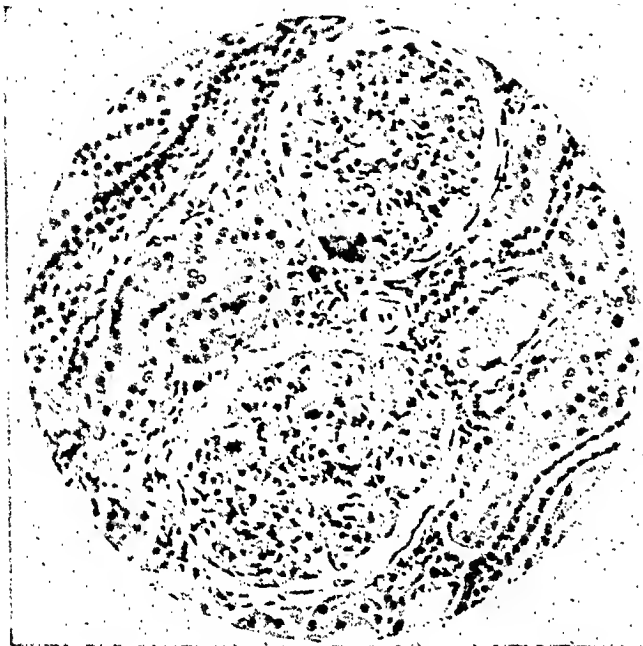


FIG. 3. Eclamptic glomeruli, similar to Figure 2, but to be compared with Figure 4.

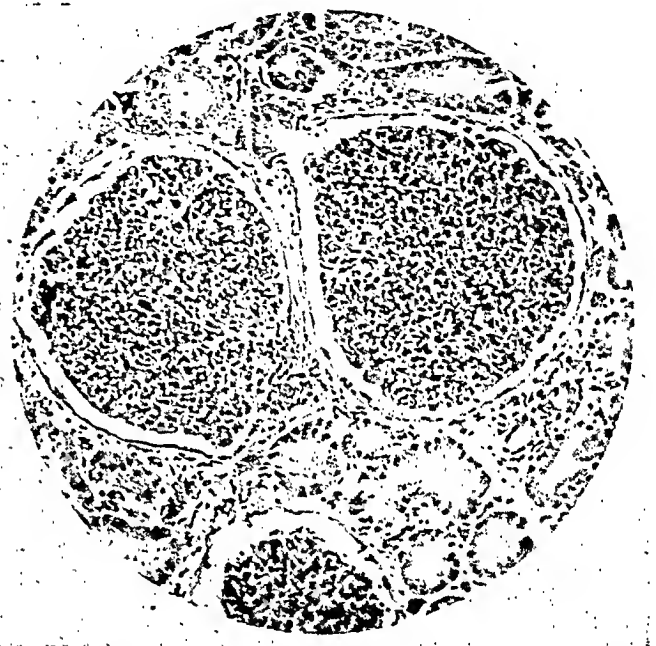


FIG. 4. Glomeruli in acute diffuse glomerular nephritis; large avascular-appearing glomeruli with marked increase in the endothelial nuclei.

embedding in paraffin must be carefully handled. Keeping tissue too long in xylol and paraffin and with too warm embedding causes considerable shrinking of the glomerulus and will therefore obscure the condition to a considerable degree. I had previously studied these changes in 2 cases of my own in which the sections were cut in celloidin, and here the glomerulus filled out the capsule in both cases very strikingly. If blocks are not cut too large, sections can be cut quite thin enough in celloidin, and to one who is looking for these changes for the first time, they would appear very striking.

In the convoluted tubules one most frequently sees a very marked diffuse

but Fahr finds the smaller arterioles, particularly the vas afferens, not infrequently involved. This change consists chiefly of a thickening and swelling of the vessel wall with a proliferation of the endothelial nuclei. Although this is not a constant finding, in several of Fahr's cases it was very striking. Occasionally such proliferation takes place in a glomerular loop, but only here and there in single loops, and never in a diffuse way as in a glomerular nephritis; which indicates that an endothelial toxin is at work, involving chiefly the vas afferens and arterioles.

Another interesting finding is the frequency with which hemoglobin cylinders

are found; these are most abundant in the straight tubules of the pyramids just before entering the pelvis, although they may be seen in any location, even in the glomerular capsule. The presence of these cylinders in the kidney is much more frequent than has been reported by previous clinical authors. Sometimes they are few, and in other cases, very numerous. Fahr has demonstrated occasionally hemoglobin in the convoluted tubules as it was apparently passing through them. He sees in

ies as well as in the glomerular loops, which were well plugged with fat. Fat, however, was more frequently found in the convoluted tubules and the glomerular epithelium. In 18 cases, which Fahr was able to study for the presence of abnormal fat, 3 showed fat very markedly, 4 were entirely free of fatty change, and the remaining cases showed only very small amounts. It appears that in these lesions the fat seen is in the nature of a fat storage (*Speicherung*) somewhat as is seen in

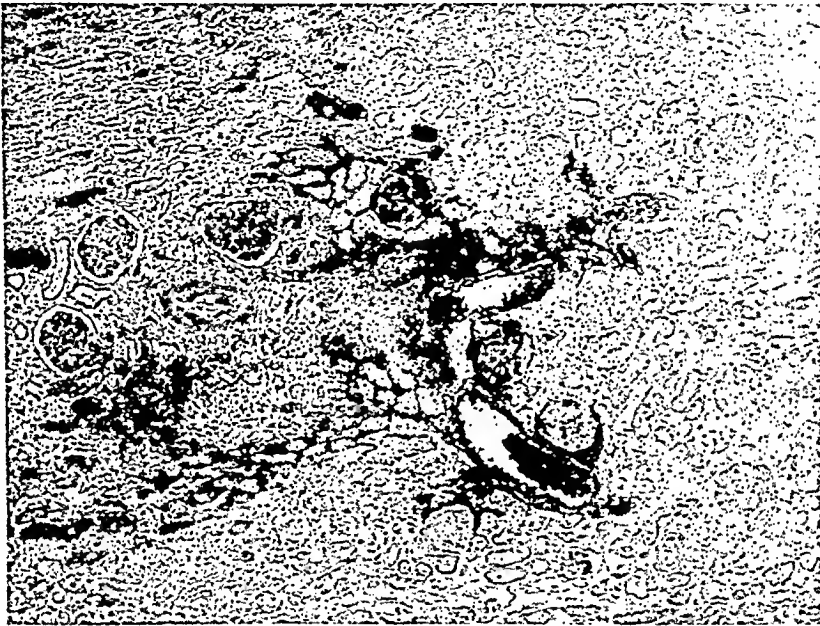


FIG. 5. Case 11 of Jardine and Teacher; cortical necrosis, area to right entirely necrotic; in the center marked dilatation and stasis of glomerular loops and neighboring vessels, with marked interstitial reaction. Left, several glomeruli which show changes characteristic of eclampsia in the less severely damaged kidneys.

connection with these findings in the neighboring blood vessels, chiefly the veins, red blood cells which are massed together in an amorphous state with no evidence of cell outline and having what Fahr calls a "lacquered appearance." This latter finding, which is very marked in some cases, Fahr feels, has a definite relation to the frequent formation of hemoglobin cylinders in these cases (Fig. 8).

Fat emboli as described by Virchow, Schmorl and Winkler, Fahr found in only 1 case in his series, which he illustrates in Hinselmann's monograph. In this case he found fat emboli in the interlobular arter-

ies as well as in the glomerular loops, which were well plugged with fat. In eclampsia also we are frequently dealing with a marked lipemia.

In summing up these findings, Fahr, comparing his findings with observations of previous writers, states that they have placed considerable stress on such lesions as fatty degeneration of the tubules and glomerular epithelium, albuminous degeneration of the convoluted tubules and the thrombotic processes in the glomerular capillaries and larger vessels. He has seen all these things in his study, but holds that of these changes the albuminous degeneration and the thrombosis are more

typical and important. But, more constant and more important, he believes, are the changes which he has described in the glomerulus, and in the arterioles, particularly the vas afferens and the hemoglobin cylinders. Finally, he believes that this picture can be explained from the fact that the pregnancy kidney and the eclamptic kidney, manifesting these changes in varying degree, are subject to the action of a poison which brings on degenerative changes by inducing a spasm of the vessels

subject. Perhaps there is something in the climate or diet in Glasgow which may be a predisposing factor. Having obtained sections from 3 of these cases, I compared them with the material of Professor Fahr.

From this comparison, I am reasonably certain that the glomerular changes as described by Fahr were present in these cases. This was evident from the appearance of the glomeruli not involved in necrotic areas. In Case 11 of Jardine and Teacher this was apparent. I have illustrated this case

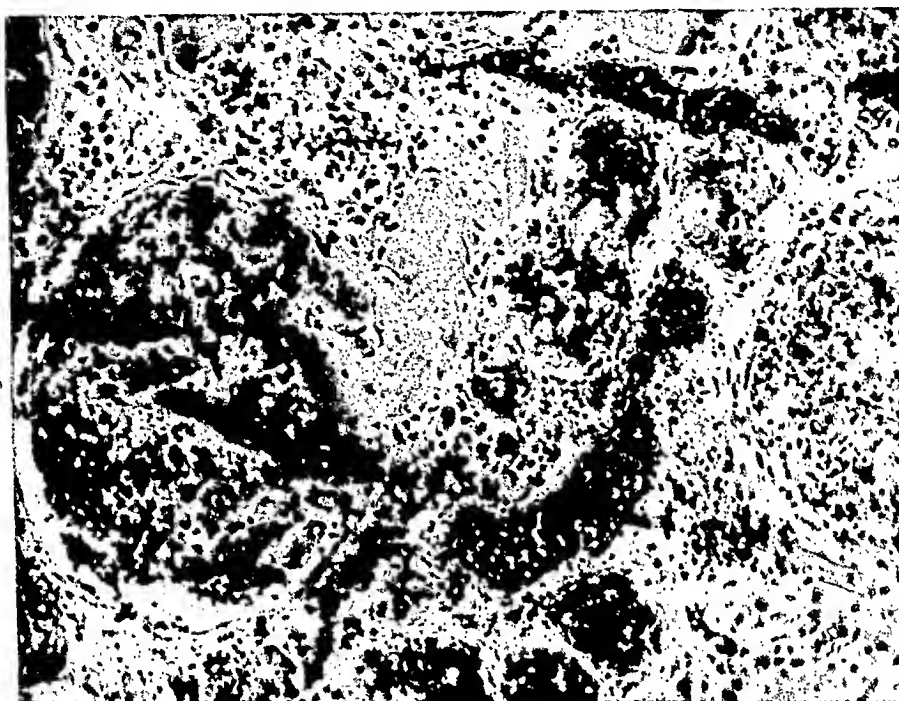


FIG. 6. Glomerulus in Cruickshank's case of cortical necrosis. Glomerulus itself markedly distended with blood. Surrounding vessels also filled with blood. In the center of the picture there is a hyaline thrombus completely filling a very thin-walled vessel coming from the glomerulus; very likely vas efferens (see text).

leading to the glomerulus, causing a lessened blood supply (an anemia), which, in turn, leads to the characteristic degeneration and swelling of the glomerular loops.

In marked contrast to the material studied by Professor Fahr are the rarer lesions of so-called cortical necrosis of the kidney in eclampsia. These lesions are those which Lubarsch undoubtedly placed in his third category. These cases have been chiefly reported from Glasgow, where they have had about 10 cases in sixteen years. It apparently is very rare in America, Klotz in 1908 being the only American writer, to my knowledge, to discuss the

(Fig. 5) and shall briefly describe it. A more complete description, however, can be obtained by referring to the original article. In this case two-thirds of the total cortex was necrotic and many thrombi were found in the smaller arteries. Teacher felt that spasm of the vessel wall played a considerable part in the production of the thrombi. In studying sections from this case (Fig. 5) one was impressed with the fact that there were 3 distinct areas: first and most marked, the area of complete necrosis, very anemic; second, an area where the glomerular loops were greatly filled with blood and with the glomerular



nuclei more or less intact, with a considerable dilatation of the vessels in this region and a marked reaction in the interstitial tissue; third, and very interesting, an area where the necrosis is not marked, at least does not involve the glomeruli, the latter showing typically the findings of Fahr, being large and appearing avascular, and the individual loops are not apparent and with no increase in nuclei (well to the left in Fig. 5). Since this condition is seen so strikingly in the least involved areas, one

case reported by Cruickshank. In Figure 6 I have illustrated a glomerulus from this case markedly dilated with blood and with a thin-walled vessel, plugged completely with a hyaline thrombus; I take this vessel to be most likely the vas efferens. It is certainly not the vas afferens because of its size and very thin structure. That this may be actually the location where the process frequently starts can be proved only by future study through serial sectioning of such material. However, in the single

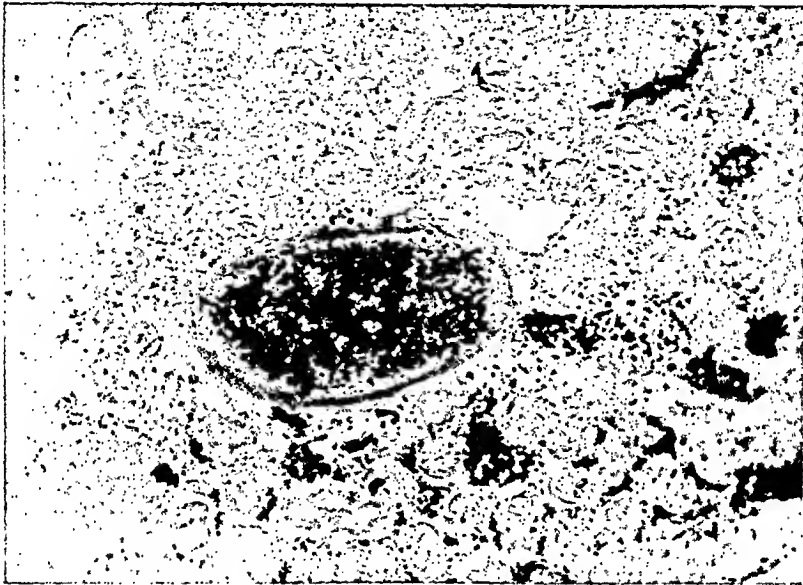


FIG. 7. Well-formed thrombus in a fairly large-sized vessel in case of cortical necrosis of the kidney.

could perhaps assume that it had been a forerunner in the more involved areas. I thought that in these cases the blocking of the circulation might have its incipency in the vas efferens, or a continuation of it, leading to a damming back of the blood in the glomerulus and the vessels leading to it, causing a stasis with subsequent thrombosis and extending to the vessels of larger size, causing anemic infarcts in the areas in which the glomeruli had not gone through the above-described changes in circulation. I mention this because I have observed several places where hyaline thrombi were found in thin-walled vessels in close connection with such dilated glomeruli. This was seen particularly well in the

sections this condition was very striking, and therefore, I believe, worthy of emphasis. That other factors may lead to such dilatation and stasis of the glomeruli is also clear, but discussion on that point will be omitted here. From these findings, this point was developed and with the thought that in the beginning we are dealing with a large swollen glomerulus through which the circulation is much slowed, which would cause even greater slowing in the vas efferens; also considering the high fibrinogen content of the blood in many cases of eclampsia and that an endothelial poison is also at work, the vas efferens or a continuous vessel would be a most likely location for the beginning of the block in



circulation producing the above-described picture of dilatation and stasis with subsequent thrombosis.

In considering these pathological findings it might be of interest to mention the valuable recent work of Stander, who from elaborate clinical and blood studies has given us a very satisfactory classification of the toxemias of late pregnancy. As his most recent article is the only one available at present, I can merely mention his classification and discuss it briefly:

nephritis as a medical condition growing worse with each succeeding pregnancy. Unfortunately his first paper, with his chemical findings on which he bases this classification, is not available, but judging from his charts concerning the return to normal of urine and blood pressure, the first 3 types in his classification act very similarly, returning to practically normal rapidly. In chronic nephritis, as would be expected, this is delayed and remains definitely abnormal.

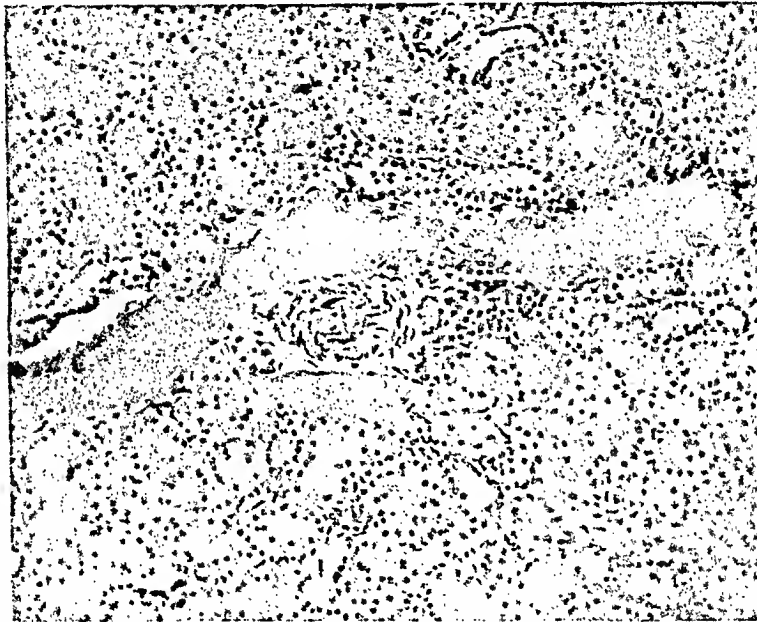


FIG. 8. Eclamptic kidney: two veins filled with blood masses which appear homogeneous due to disappearance of red blood corpuscles, frequently associated with the finding of hemoglobin cylinders.

1. Low reserve kidney.
2. Preeclampsia.
3. Eclampsia.
4. Eclampsia and chronic nephritis (rare).
5. Chronic nephritis.

In cases of low kidney reserve the albuminuria and an elevation of blood pressure are slight; there is no permanent kidney damage, and in subsequent pregnancies the patient shows no signs of toxemia, but only a slight disturbance as in the previous pregnancy. He considers these cases separate from preeclampsia and eclampsia, not apparently as milder lesions of the same condition, but something different. He regards the combination of eclampsia and chronic nephritis as rare. He regards chronic

Leaving out of consideration the part the liver might play in bringing about these clinical types, the kidney, judging from the rather characteristic changes which may occur in pregnancy and eclampsia, is apparently affected more similarly in these various groups. It must be remembered that products, toxins, if you will, which collect in the blood during pregnancy as a result of fetal metabolism, placental degeneration, or perhaps liver damage, must be chiefly eliminated by the kidney. The kidney, however, can be affected by the same underlying factor, in such a way that different degrees of kidney damage can result; this will depend upon the character of the intoxication, its onset,

whether slow or abrupt, mild or severe; the ability of the normal kidney to resist damage, varying, of course, with the kidney in question; and the presence of previously existing chronic kidney lesions of different severity. It has been my experience in cases of chronic nephritis in pregnancy that, in most instances, although the patient's condition is worse for the pregnancy ultimately, the degree of change is sometimes very slight and hardly ever in keeping with what we might expect from the degree of exacerbation of symptoms and signs during pregnancy.

Therefore, I cannot feel, as Stander does, in regard to chronic nephritis in pregnancy, that we are dealing chiefly with a so-called medical condition. I believe we are dealing here with a condition concerned chiefly with the pregnancy itself. We have in these cases a limited amount of functioning glomerular tissue, which is required to carry out not only the elimination of the individual, but also the increased burden thrown about it by the metabolism of the pregnancy. These products, concentrated as they must be in passing through this normal tissue, in my opinion, could lead to changes in this tissue more readily than in a kidney previously normal. In chronic nephritis in pregnancy the NPN usually rises quite definitely; this is explained in part by the fact that the glomerular system is already markedly changed, but should also be explained by changes which may occur in glomeruli, normal or partly normal to begin with, which might be expected to present the characteristic changes as described by Fahr. When these changes occur in the eclamptic kidney there is usually no great retention of NPN, if any at all, but in

the complicated case due to the limited normal functioning tissue we are dealing with another matter. Therefore, I believe that in chronic nephritis in pregnancy the exacerbations of symptoms and signs are due more to the changes superimposed by the pregnancy itself, which may be quite transitory, than to any marked increase in the chronic nephritis. This point can be definitely proved only by the study of cases of chronic nephritis at autopsy, where the preexisting glomerular damage is not so extensive as to obscure changes in the glomeruli which might be due to the pregnancy itself.

Since writing the above I was fortunate in obtaining a copy of Herman Elwyn's "Nephritis," in which he describes very fully the kidney of pregnancy, and quotes Fahr's findings. He also discusses at some length the causation of the arteriole spasm which undoubtedly is the chief factor in producing the kidney changes. It would be well for any one interested in eclampsia to refer to this work.

#### REFERENCES

- FAHR, T. Study of Hinselmann. *Die Eklampsie*. Bonn, 1924.  
 FAHR, J. T. Study of Henke and Lubarsch. *Nieren*. Berlin, 1925, vi, 254.  
 JARDINE, R., and TEACHER, J. H. Two cases of symmetrical necrosis of the cortex of kidneys associated with puerperal eclampsia and suppression of urine. *J. Path. & Bacteriol.* (Cambridge), 1911, xv, 137.  
 CRUICKSHANK, J. N. Case of suppression of urine with symmetrical necrosis of renal cortex in a parturient woman. *J. Obst. & Gynec. Brit. Emp.*, 1923, xxx, 336.  
 STANDER, H. J., and PECKHAM, C. H. Classification of toxemias of latter half of pregnancy. *Am. J. Obst. & Gynec.*, 1926, xi, 583.  
 STANDER, H. J. Clinical and experimental studies on toxemias of pregnancy. *Am. J. Obst. & Gynec.*, May, 1927, xiii, 551.  
 ELWYN, H. *Nephritis*. New York, Macmillan Co., 1926, pp. 166-182.



# THE TREATMENT OF POST-PARTUM HEMORRHAGE

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THERE is no subject of greater interest to the obstetrician and general practitioner than the control of hemorrhage following the birth of the child. The average loss of blood post partum is variously estimated at 343 c.c. by Williams in 1000 spontaneous labors; 300 c.c. by De Lee; 300 to 500 by Leavitt and 505 c.c. by Ahlfeld. We have usually considered the loss of 500 c.c. as a first degree hemorrhage, the loss of 750 c.c. to 800 c.c. as a second degree hemorrhage and the loss of 1000 c.c. or more a severe or third degree hemorrhage. It is a matter of common knowledge that one woman may have but little reaction from the loss of an amount of blood which would seriously affect another woman. If a moderate anemia exists before labor begins, the loss of even 500 c.c. of blood may be attended with very noticeable results.

There is a widespread belief that women at the time of confinement can stand the loss of a considerable amount of blood with impunity, and, fortunately, blood loss during labor does seem to be attended with less harm than at other times. But the fact that women frequently do not show serious reaction to fairly extensive blood loss has resulted, in our opinion, in creating a false sense of security and has led to a certain degree of carelessness and lack of proper supervision of the third stage of labor. It may be said without fear of contradiction that blood loss should be minimized as much as possible in every case of labor and that no effort should be spared to accomplish this result.

In this short paper we cannot discuss the prophylactic treatment of hemorrhage, for that would involve the discussion of the management of labor, a field far too large

for our consideration at this time. We cannot dismiss this phase of the question, however, without stating that in our opinion the present tendency among obstetricians to shorten the second stage of labor by the use of the low forceps operation, when the head is at the outlet and inertia is present, is a most commendable practice. The patient is spared hours of unnecessary suffering and her powers of resistance are not decreased. After the birth of the child, the fundus should reach a point at, or below the level of the navel, and from this time on, the nurse, or assistant should carefully observe the height of the fundus, for it should not be allowed to rise above the navel level, without keeping in mind the possibility of internal concealed bleeding. Bleeding into the vagina and uterine cavity can be detected, as a rule, by careful observation of the fundus and the size of the uterus, and we make it a rule to insist that the uterus be kept under close observation during the entire third stage, for it is only by alert supervision that hemorrhage can be minimized and promptly treated.

Let us consider briefly cervical and vaginal bleeding. Hemorrhage from torn vessels in the vagina can be quickly repaired by suture. Bleeding from a torn cervix can usually be diagnosed by noting a stream of bright blood coming from the vagina, with a hard, well-contracted uterus. In many instances after the placenta has been expressed we have placed a pad over the vulva, crossed the patient's legs and refrained from massage of the fundus, with almost immediate cessation of bleeding. In a few cases bleeding will continue and the torn cervix must be repaired in the usual way.

## Brodhead—Post-Partum Hemorrhage

Hemorrhage from the uterus itself can be prevented and controlled by: (1) the use of pituitary extract; (2) the expulsion of the placenta; (3) the use of a uterine tampon of iodoform gauze.

For many years we have given as routine a hypodermic of 1 c.c. of infundin immediately after the birth of the child, at the beginning of the third stage of labor.

Several years ago Langrock and the writer<sup>1</sup> administered to 100 patients, immediately after the birth of the child, 1 c.c. of infundin hypodermically. We waited the customary twenty minutes, during which time the uterus was carefully observed and the blood loss measured; at the end of this period the placenta was expressed, if it had not been expelled spontaneously. After the delivery of the placenta, all blood loss during the succeeding hour was measured. There were 43 primiparae and 57 multiparae in this series, of which 96 patients were at or near term. Eighty-seven women were delivered spontaneously, and 13 by operative procedure.

The placenta was expelled spontaneously in 19 cases, compared to a total number of 9 spontaneous placental expulsions in 1000 labors reported by Williams<sup>2</sup> in which pituitrin was not used. In these 19 cases the minimum third stage was four minutes and the maximum was eighteen minutes; the average being ten and one-half minutes. In 78 cases the Cr  d   method of expression was used. In 3 cases the placentae were manually extracted. In the first case the Cr  d   method was tried several times and then when the placenta was visible in the cervix at the outlet, manual extraction was easily performed. In the second case, the Cr  d   method was tried repeatedly and then because of continued bleeding, the hand was passed into the uterus, where an hour-glass contraction was felt, the placenta being partly above and partly below the area of constriction. The placenta was not adherent and was very easily extracted. In the third case,

after one hour, the placenta was found in the vagina and was manually removed.

In 26 cases (12 primiparae and 14 multiparae) the blood loss did not exceed 30 c.c. The maximum blood loss in primiparae was 525 c.c.; in multiparae 1230 c.c. (3 lb. in weight). The average blood loss in primiparae was 110 c.c. and in multiparae was 153 c.c. The average in all cases during the third stage was 135 c.c.

In 77 cases (33 primiparae and 44 multiparae) the blood loss did not exceed 30 c.c. for a period of one hour following the delivery of the placenta. The maximum blood loss in primiparae was 750 c.c.; in multiparae was 800 c.c. The average blood loss in primiparae was 47 c.c.; and in multiparae was 36 c.c. The average in all cases was 41 c.c.

The average total blood loss of all primiparae who delivered themselves spontaneously was 160 c.c. This may be compared with the average total blood loss in the 10 operative primiparae which was 153 c.c. The average total blood loss for all primiparae was 158 c.c. The average total blood loss in multiparae delivered by operation was 236 c.c., making an average total blood loss in all multiparae of 191 c.c. The average total blood loss in the complete series of 100 cases was 177 c.c., which corresponds closely with a blood loss of 180 c.c. in a similar series of 100 cases reported by Ryder.<sup>3</sup> It was of interest to note that in 13 operative cases the maximum blood loss was 390 c.c. Further, in Williams' series of 1000 cases without pituitrin there were 130 in which 600 c.c. or more of blood were lost. In contrast with these figures Ryder in his series of 100 cases with pituitrin had no blood loss of 4 c.c., while in our series we had but 4.

We believe that in the vast majority of cases, the method as outlined is safe and valuable in minimizing blood loss. We agree with Ryder that the uterus must be observed just as carefully as when pituitrin is not given. There is the possibility of irregular or hour-glass contraction of the uterus which occurred in

one of our 100 cases, but this condition has also been observed a number of times when pituitrin had not been given.

In the absence of bleeding, the fundus is held at or about the level of the navel for fifteen to twenty minutes and then the Credé method of expression is used. Should bleeding occur, the uterus is massaged, the Credé method tried, and then, if necessary, the placenta is extracted manually.

The danger of extracting the placenta with the gloved hand is less than the harmful results of continued hemorrhage. In our own experience in former years we know that we have lost valuable time with resulting blood loss from waiting too long to remove the placenta, and we now empty the uterus promptly.

After the placenta has been removed, if bleeding occurs, some preparation of aseptic ergot is administered hypodermically and the uterus and vagina are tightly tamponed with 5 per cent iodoform gauze, introduced into the uterus through a metal uterine packer. In recent years we have used the uterine tampon more and more, not only for post-partum hemorrhage, but also at the time of cesarean section. We use for packing the large sized uterine packer, which consists of a hollow metal tube  $11\frac{1}{2}$  inches in length, 1 inch wide at the blunt uterine end and with a lumen of  $\frac{3}{4}$  inch. The plunger consists of a steel rod 12 inches in length,  $\frac{1}{8}$  inch in thickness, bifurcated at the uterine end, and surmounted at the proximal end by a metal ring 1 inch in diameter. Through this hollow packer a 10-20 yard strip of 5 per cent iodoform gauze, (12 inches in width, folded to 1 to  $1\frac{1}{2}$  inches) can be introduced directly into the uterine cavity, uncontaminated by contact with blood or vaginal secretion. This method of packing the uterus is safe, clean, and efficient, and should be generally adopted. On account of the packing, catheterization may be necessary for a few days. We usually leave the gauze packing undisturbed until the fourth day, when it can be easily and safely

removed. Earlier removal of the tampon has, in our experience, given more discomfort, in a few cases has been followed by moderate bleeding, and in one instance the bleeding was so profuse that the uterus was repacked.

There are three smaller sizes of the packer, which are also useful in packing the uterus for bleeding in abortion and premature labor. The smallest packer, for use in early abortion, is  $7\frac{1}{2}$  inches in length, has a lumen of  $\frac{1}{4}$  inch and a plunger of  $8\frac{1}{2}$  inches in length. The next size is  $7\frac{1}{2}$  inches in length, has a lumen of  $\frac{3}{8}$  inch, and a plunger  $8\frac{1}{2}$  inches in length. The third size is  $8\frac{1}{2}$  inches in length, has a lumen of  $\frac{1}{2}$  inch, and a plunger  $9\frac{1}{4}$  inches in length.

All of these packers have proven to be very valuable in our work, and we strongly recommend them. In rare instances bleeding occurs through the packing, but usually pressure on the fundus, combined with the hypodermic use of pituitary extract and aseptic ergot, will check the bleeding and repacking will be unnecessary.

We have then, three valuable aids in controlling bleeding: the use of some preparation of pituitary extract and ergot, removal of the placenta, and the tight uterine tampon, a combination which is most useful and which has given us excellent results. The typing and subsequent treatment of the patient with blood transfusion is, naturally, of paramount importance, and is becoming more and more an every-day routine procedure, with results most beneficial, far reaching, and at times, indeed, bordering on the miraculous.

#### REFERENCES

1. BRODHEAD, G. L. and LANGROCK, E. G. A study of pituitary extract at the beginning of the third stage of labor. *Am. J. Obst. & Gynec.* February, 1922, iii, 170-173.
2. WILLIAMS, J. W. The tolerance of freshly delivered women to excessive loss of blood. *Am. J. Obst.*, July, 1919, lxxx, 1-17.
3. RYDER, G. H. The administration of pituitrin at the beginning of the third stage of labor. *Am. J. Obst. & Gynec.* July, 1921, ii, 61-66.

# PUERPERAL INVERSION OF THE UTERUS

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TWO cases of complete puerperal inversion have been operated on by the author, and because of their extreme rarity, are thought worthy of record. Both cases occurred in farm houses, attended by the family physician. They were primiparae and in each instance the inversion followed upon forcible expression of the placenta. One died in shock caused by excessive loss of blood and operation; the other was operated on the twelfth day of the puerperium and recovered.

CASE I. Mrs. A., aged twenty-four years, primipara, was delivered by forceps of a full-term baby weighing 8 pounds. The placenta was partially expressed and with force. Failing to deliver the placenta, the hand was introduced into the vagina. It was then that the inverted fundus was recognized. The placenta was removed and the vagina packed with gauze but the hemorrhage was not effectually controlled. All means at hand were employed to resuscitate the mother and help summoned. I saw the patient some six hours later and found her in extreme shock and with oozing of blood through the vaginal pack. We removed the pack and an effort was made to reduce the inversion. A pack was again inserted but this also failed to fully control the bleeding. With the able assistance of 2 surgical nurses and 2 doctors the fundus was amputated. A minimum of ether was employed; the operation consumed not more than ten minutes. The patient died within a few hours.

CASE II. Mrs. B., aged twenty-seven years, primipara, delivered herself after a prolonged labour. The attending physician found difficulty in delivering the placenta and doubtless used considerable force upon a relaxed uterus. Following closely upon the expression of the placenta there was profuse bleeding and shock but not for long. The attending physician failed in his efforts to reduce the inversion. Twelve days later I was called to operate the case.

The inverted fundus, which was fully delivered from the vagina, was partially gangrenous, as seen in the accompanying illustration. The fundus was amputated, recovery followed.

A perusal of the literature impresses one with the extreme rarity of complete inversion of the uterus following labour. Partial inversion of the puerperal uterus is probably not an unusual event but is seldom recognized. Certainly incupings of the placental site are of frequent occurrence. Between the slight incupings of the fundus and complete inversion are varying degrees, many of which are never recognized and not a few are spontaneously rectified without the knowledge or assistance of the attending physician or midwife.

While complete inversion of the puerperal uterus is one of the rarest of mishaps, it is inconceivable that its presence should long escape recognition, and yet there are many such instances.

As to the frequency of occurrence authorities differ widely. Madden, of the Dublin Lying-In Hospital, found 1 in 190,000; Reeve, 1 in 140,000; Breus, in the Vienna Lying-In Hospital, 1 in 280,000; Küstner, 1 in 23,000; Zanmeister, 1 in 400,000; Welpauer, 1 in 35,000; Kehrer, 1 in 2000; Brekman, 1 in 200,000; Mason and Rucker, 1 in 123,164; Braun and Sparth, none in 250,000; von Wenkel, none in 17,000; Krassoswky, none in 200,000; Crosse, Porak and Atelfeld each, 1 in a total of 134,000; Swayne, 2 in 4000; Jardine, 3 in 50,000. These make a grand total of 17 cases in 1,932,164 labours or 1 to 113,068 cases. In the past twenty-one years only seventy-six cases are reported in German literature.

The first thesis of note, in the English language, on the subject of inversion of the uterus was that of John Green Crosse



FIG. 1. Complete inversion of puerperal uterus. F, fundus; cerv., cervix; d, decidua; g, gangrene; t, Fallopian tubes.



## Findley—Puerperal Inversion

of Norwich in 1846-1847. Of the 500 cases collected by Crosse 450 were puerperal. In commenting on the occurrence of puerperal inversion Reeve is quoted as saying, "The accident may occur independently of anything done or omitted." In referring to spontaneous passive inversion Mathew Duncan said, "This occurs in cases of paralysis or inertia of the whole uterus; the organ being large, its walls are lax and capable of being inverted by little force. Bearing down produces general collapse and compression of the organ but it may produce inversion if the depressing force is applied under favorable circumstances and the inversion will become complete if the bearing down is strong and continued." He further speaks of spontaneous active inversion wherein the uterine wall is cupped (usually at the placental site), and the remaining actively contracting wall of the uterus forces the fundus down through the dilated cervix, a condition commonly referred to as progressive invagination of the fundus.

As might be expected the accident occurs with the greatest frequency in the hands of the unskilled. By far the greatest number have occurred in the private home under the supervision of a midwife or a general practitioner. Rarely is it known to occur in maternity practice. Mason and Rucker reported 65 cases and of this number one developed in the absence of a doctor or a midwife, 7 were attended by midwives, 15 by doctors in the home and 11 in hospitals.

The author recalls seeing one of the foremost clinicians of Europe perform a version with forcible expression of the placenta. A complete inversion followed closely upon the delivery of the placenta and efforts to replace the inverted fundus failed. The uterus was amputated and a post-mortem examination made the following day, revealed the transfixion of a loop of bowel by sutures.

The causal factors commonly listed are forcible expression of the placenta and traction on the cord. As Küstner says, it is difficult to conceive of an inversion of the

uterus being produced by traction on the cord with the uterus firmly contracted, and Crampton adds that the cord will break before a firmly contracted uterus will be forced to invert. As with traction on the cord, so with compression on the fundus, there must be relaxation of the uterus to admit of an inversion. Given a relaxed uterus and a dilated cervix, it is possible that intra-abdominal pressure, and possibly a heavy adhered placenta, may produce inversion. Cases have been ascribed to coughing and to straining at stool though in such cases it is quite probable that there had been a preexisting, though unrecognized, partial inversion of the fundus. On the other hand Micholitsch asserts that inversion is possible in the presence of a firmly contracted fundus provided the lower uterine segment is flaccid. In this connection it is of interest to note that inversion has rarely followed abortion. Von Thorne collected 139 cases in which there had been no forcible expression of the placenta or traction on the cord. In 50 cases reported by Mason and Rucker there were 16 in which traction was made on the cord, 14 in which the placenta was forcibly expressed, and 3 in which there was manual delivery of the placenta. In the remaining 17 cases there were no known causal factors. Of the 224 cases collected by Crampton, in only 11 did the inversion occur more than two hours after labour. In 93 of the 224 cases the inversion passed into the chronic stage, a time arbitrarily fixed at thirty days post partum. In an analysis of 521 puerperal inversions, Thorne found 92 in the chronic stage. Lee reported 88 cases of which number 38 per cent were credited to traction of the cord and 6 per cent to other means of delivering the placenta. In 66 per cent the placenta was adhered and in 9 per cent the cord was short or coiled about the neck. These data suggest the placental site as the original point of inversion.

While collapse associated with hemorrhage is the usual accompaniment of inversion, cases are on record in which there has been neither collapse nor hemorrhage. Again there may be collapse without

hemorrhage or hemorrhage without collapse.

Death may follow speedily upon inversion. Beckmann gives a mortality of 14 per cent, Smith of 25 per cent, Kehrer of 25 per cent. There was death in 80 of the 109 cases collected by Crosse. Seventy-two of this number died within an hour post partum. Vogel collected 100 cases, of which number, 23 died, death ensuing within a few hours after labour in 19 cases. It would appear that hemorrhage is the immediate cause of death in the greatest number of cases. In 374 cases collected by Thorne and Zanmeister, 5.7 per cent died from hemorrhage and 2 per cent from sepsis. Mason and Rucker have more recently reported a mortality of 15.3 per cent. None of these deaths occurred in hospitals, while in the hands of doctors in the homes there was a mortality of 12.5 per cent and in the hands of midwives a mortality of 26 per cent.

In the management of acute complete puerperal inversion, shock and hemorrhage are the first concern. And we ask, should an effort be made to reduce the inversion in the presence of profound shock? Hans Smith is of the opinion that the correction of the inversion by taxis will not deepen shock if done without a general anesthetic, while the statistics presented by Thorne and Zanmeister argue for added risk. These authors report a mortality of 4.6 per cent in which replacement was effected while shock was on, as against a mortality of 3 per cent from shock and hemorrhage with no effort toward replacement. The position of Thorne and Zanmeister is supported by Phillips who records a mortality of 30 per cent with reposition, and only 5 per cent where no attempt was made to replace the uterus. A delay of from two to six hours before attempting to replace the inverted uterus is suggested; this presupposes that the loss of blood has been checked and that the patient is restored from shock. Failing to check the loss of blood and to resuscitate the patient, an attempt should be made to correct the inversion by taxis and if this fails there can be no other recourse than operation. A blanched patient is at best a

poor surgical risk even for minor procedures, hence the dictum: avoid all surgical procedures as far as possible on a blanched patient. Kochs, Thorne, Roberts and Schaeffer all advise blood transfusion as a preliminary measure before operation.

Laceration of the vaginal walls and perforation of the uterus have resulted from efforts at taxis, suggesting the utmost caution. Where infection exists taxis should not be employed. In such cases amputation is the method of choice.

#### RESUMÉ

1. Partial inversion of the puerperal uterus is of common occurrence, often unrecognized and self-rectifying.
2. In 1,932,164 labors complete inversion occurred 17 times; or 1 in 113,063; one of the rarest of obstetric mishaps.
3. The greatest number occur in the home deliveries, in the hands of doctors and midwives. Few cases have occurred in maternity hospitals.
4. Forcible Credé manoeuvre and traction on the cord can produce inversion only when the fundus is relaxed and the lower uterine segment flaccid.
5. An unrecognized partial inversion may be made complete by increased intra-abdominal pressure (coughing, straining at stool).
6. Approximately one-third of all cases pass into the chronic stage (thirty or more days after labour).
7. In two-thirds of all cases the placenta is said to be adherent.
8. Inversion may occur without collapse or hemorrhage and has repeatedly been unrecognized. The mortality ranges from 14 to 26 per cent.
9. Here, as in all surgical practice, the first concern is to control hemorrhage and to relieve shock. A blanched patient is a poor surgical risk. Failing to control the loss of blood or to relieve shock, an effort to replace the fundus should be made. If this procedure is unsuccessful the fundus must be amputated. An infected uterus should be removed.

# DIAGNOSIS AND MANAGEMENT OF EXTRAUTERINE GESTATION WITH AN ANALYSIS OF 120 CASES

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MUCH has been written on ruptured extrauterine gestation, yet neither its etiology nor its pathology are thoroughly understood, nor is any method of operative treatment universally accepted. Any form of treatment depends, of course, upon the diagnosis which still seems to present considerable difficulty.

The vast majority of cases need operative relief, yet undoubtedly some recover without it. As a rule immediate laparotomy follows diagnosis, but not everywhere. Rather futile discussions still go on concerning removal of the ovary on the affected side, or extirpation of the opposite adnexa, so-called prophylactic sterilization, while a few do curettage for diagnosis, while a few curette routinely as part of their standardized treatment. Drainage is still practiced. Most operators show fairly consistent results although not at all agreed as to the most favorable time for intervention.

It is good of course to advance new theories in etiology, and to speculate, for instance, on the source of the vaginal blood, or the histology of the endometrium. It may be right, too, for one to have a fixed idea as to the best time for operation, and to withstand successfully all argument for a change in operative policy, without giving due consideration to the results of others. For this there may be good reason, and not much harm may follow. It is apparent however, that continuous reduction of the mortality of extrauterine pregnancy depends more upon its early clinical recognition than upon its treatment.

In the cases presenting frank evidence of massive bleeding, the general practitioner usually makes the diagnosis. With

lesser bleeding the diagnosis is perhaps not so obvious, and when hemorrhage is negligible, diagnosis depends upon careful appraisal of the history, with painstaking and methodical search for symptoms and physical signs caused by the escape of blood into the peritoneal cavity, or the wall or lumen of the tube. Only when this is borne in mind, when we remember that histories are only seldom atypical, that some signs are always present, and that the others vary directly with the amount of blood lost, will we get satisfactory results.

For this study 120 consecutive cases of ruptured extrauterine gestation which occurred in my services at St. Catherine's and the Greenpoint Hospitals have been analyzed. All the histories were carefully taken and search made in every case for the symptoms and signs we hoped to find. Operations were done by 5 operators, and in every case the diagnosis was confirmed by the pathologist.

In this series there were 2 deaths, one intraligamentous hematocoele with secondary rupture into the peritoneal cavity, the other secondary abdominal pregnancy at almost seven months. Death in the first case occurred six hours after operation as a result of shock and added hemorrhage incident to the operative procedure; in the second case death occurred thirty hours later and was attributed to acute gastric dilatation. Mortality then was 1.7 per cent.

Two were abdominal pregnancies, one at term, the other at the seventh month; in both the history clearly pointed to early rupture of a tubal pregnancy. Five cases ruptured at about the sixteenth week, and

nine cases at about the twelfth. The remaining 104 cases ruptured before the eighth week.

Although there seems to be some confusion as to what constitutes clinical rupture, we know that most cases have ruptured more than once before coming to operation. Rupture may take place into the lumen of the tube or more often into its wall. There may be no blood in the peritoneal cavity, but rupture none the less has taken place. Pain is peritoneal and pain means rupture. All our cases, however, showed more or less blood in the peritoneal cavity.

The youngest patient was eighteen years of age, the oldest forty-two; 78, or 65 per cent, were between the ages of twenty-four and thirty-five. Twenty-five patients had never been pregnant, and 3 of these were single. The longest period of sterility was sixteen years, and 41 patients had not been pregnant in five years or more. Twenty-five were primiparae, while 70 were multiparae; of these multiparous women 35 had 2 children, 22 had three, and 13 had from 4 to 11.

Primigravidae.....	25
Primiparae.....	25
Multiparae.....	70
2 children.....	35
3 children.....	22
4 to 11 children.....	13
Not pregnant in over 5 years....	41

Absolute sterility is then not an important factor in the diagnosis, as 95 patients had been pregnant at least once. Frequent childbearing too is of little importance, and of possible significance only is the fact that in 41 cases five years or more had elapsed since their last pregnancy.

In attempting to evaluate pelvic disease as a predisposing factor in etiology, we found that there were, in

33 cases, marriage infection as determined by typical history.

67 cases, previous abortions.

17 cases, dysmenorrhea.

24 cases, complicated labor just previous.

27 cases, operations, abdominal and pelvic, as follows:

7 cases appendix	1 to 14 years before.
2 cases gall bladder	8 and 14 years before.
7 cases ectopic	1 to 13 years before.
1 case suspension	2 years before.

1 case colpotomy	3 years before.
1 case Dudley	7 years before.
1 case umbilical hernia	5 years before.
2 cases salpingectomy	Time unknown.
5 cases laparotomy for sterility	Time unknown.

Inflammatory changes within and near the genital tract undoubtedly play a large part in etiology, and search for them constitutes an important part in diagnosis. Twenty-eight per cent of our cases presented what we considered strong evidence of specific infection; 56 per cent had had abortions, although not always just previous; 20 per cent had had some sort of complicated delivery as a termination of their last pregnancy, and in all of these convalescence was thought to be febrile, although this was but a deduction from the history; 23 per cent had been subjected to operation; not all gynecological, it is true, but pelvic, with but 3 exceptions, where routine examination of the pelvic contents may well have been part of the procedure.

No anomalies were seen, although examination of torn and distorted material is very difficult. Dysmenorrhea was tabulated only as premarital, but in most cases it had been relieved by parturition.

Although a large number of cases had had abortions, it is necessary of course, to discount this fact in diagnosis. They are common enough. The high incidence of infection, however, specific or otherwise, cannot be disregarded, and the importance of the laparotomy scar cannot be overestimated.

Pregnancy occurred with about equal frequency in the right and left tubes: in the right tube 62 times, and in the left 58 times. The location of the pregnancy was as follows:

Abdominal.....	2
Interstitial.....	2
Isthmial.....	17
Ampulla.....	87
Tubo-ovarian or fimbrial.....	9
Stump of previously amputated tube.	3

Rupture of the tube occurred in all the isthmial and interstitial forms, and where the ovum was situated in the pre-

## Gordon—Extrauterine Gestation

viously amputated tubes. All the pregnancies in the free portion resulted in tubal abortion, as did 51 of the ampullar pregnancies; 36 of these were tubal ruptures, 3 into the broad ligament.

In all our cases but 9 there was more or less vaginal bleeding; as a rule repeated spottings. Marked bleeding occurred in 26 cases. The average period of amenorrhea was six weeks, a delay of two weeks; but 22 cases had missed no period at all, carefully checking up the last two periods for time and character. Spotting and pain however, ushered in the symptoms in every one of these cases. Every case then had bleeding.

Examination of the blood was of great assistance in diagnosis and prognosis, and complete blood counts were repeatedly taken on all our patients. Although leucocytosis was not always present, the highest count recorded was 35,000. The polymorphonuclear count was over 80 per cent in 83 cases, and often as high as 95 per cent, showing a general rise proportionate to the white cell increase, and affording an excellent index to the volume of blood loss, decreasing as hemorrhage stopped.

The lowest red cell count was 1,490,000, while in 71 cases the count was below 4,000,000. The lowest hemoglobin estimate was 25 per cent, while in 80 cases it ranged between 50 and 70 per cent. The fall was constant but later than the leucocyte rise.

In tabulating the symptoms of which the patients complained we found that,

- 120 cases had pelvic pain.
- 49 cases had repeated syncope.
- 90 cases had vomiting of rupture.
- 24 cases had passed tissue.
- 18 cases had painful defecation.
- 39 cases had painful urination.
- 23 cases had a chill.

Pain is constant then, and it and bleeding are the most important factors in the diagnosis. Usually indefinitely cyclical, it varies directly with the extent and character of the rupture and the amount of

blood loss. Its precise location is of no importance. In 5 of our cases, however, primary pain in the shoulder, as pointed out by Rubin, has been helpful in diagnosis.

Syncope occurred in 40 per cent of our cases (mostly partial, it is true, without loss of consciousness),—a "sinking" sensation in the epigastrium with giddiness and a tendency to fall. Close inquiry will often elicit this valuable symptom.

Vomiting coincident with rupture occurred in 75 per cent of the cases. The ordinary nausea and vomiting of early pregnancy were not observed very often, possibly because of the frequent occurrence of early rupture.

Twenty-four or 20 per cent of the cases gave a history of passing tissue. This was interpreted to be decidua. In only 5 cases was tissue observed in the hospital, and in 2 of these the decidual cast was complete. Of great value when seen, it always occurs of course, but usually eludes us.

Painful defecation has often called our attention to the ectopic diagnosis. Occurring in 15 per cent of our cases, it is of importance in differential diagnosis because the inflammatory pelvic mass rarely causes dyschesia unless an abscess is present.

Painful urination occurred in 33 per cent of our cases, a relatively large number, but the frequency of early pregnancy, and the pain of free blood in the pelvis.

A chill, too, is of diagnostic value. Present in 20 per cent of the cases it, like thirst and jaundice and other infrequent symptoms, helps to complete the clinical picture.

In the examination of the patient we have noted the following:

PHYSICAL FINDINGS	
Pelvic mass.....	94
Abdominal mass as well.....	20
Mass indefinite.....	22
Mass not mentioned.....	4
Enlarged uterus.....	77
Soft cervix.....	66
Pain on moving cervix.....	113
Fluid wave.....	17
Shifting dullness.....	22
Breast signs.....	22
Highest temperature 100° F.....	111

A definite mass was found then in 78 per cent of our cases; in 18 per cent more we were reasonably sure of its presence but could not be positive: a total of 96 per cent. The mass was most often in the cul de sac, usually not large, usually fluctuant or boggy, and exquisitely tender, far more so than any inflammatory lesion we have ever seen. Arterial pulsation over it was not often observed. The mass felt abdominally in 14 per cent of the cases was always large. Severe intraligamentous hemorrhage may be diagnosed by the characteristic shape of the parametrial mass, and the absence of blood in the flanks.

The enlarged uterus and soft cervix are perhaps of little importance in diagnosis, as the increased size is usually within the normal multiparous range. In many cases however, this information is helpful.

Pain on moving the cervix was noted in 94 per cent of our cases; almost constant. Drawing the cervix forward causes intense pain, almost a positive sign.

Search for shifting dullness and fluid wave should be part of every routine examination where the ectopic diagnosis is a possibility. When found it is of course conclusive. In 5 cases where shifting dullness was present, failure to demonstrate a fluid wave was attributed to beginning organization of the blood mass. At this time rigidity, tenderness and peritoneal rebound may be observed. Always early signs, they may not be found if much time has elapsed since rupture. Distention is typically below the umbilicus and persists. Careful search for these signs will yield more constant results than scrutinizing the umbilicus for bluish discoloration, which could only be an unusual occurrence.

Breast signs are of interest, and occasionally help in the diagnosis of pregnancy.

Low temperature and pulse with the evidence of an acute abdominal lesion are characteristic of ectopic. Only 1 patient had a temperature of 103.6°F., and in eight the temperature reached 102°F.

Preoperative diagnosis was correctly

made in 105 cases, or 87 per cent. In 10 cases the preoperative diagnosis was not recorded, and in the remaining 5, the diagnosis was fibromyoma, twisted ovarian cyst, hydrosalpinx, and salpingo-oophoritis (2 cases).

Operation was done in the reactive stage, when pulse volume and diastolic pressure improved, when leucocytosis dropped, when, in short, in our judgment, the patient was ready for added operative shock. In many cases, the operation was done upon admission. In 70 per cent of our cases, however, operation was delayed from four hours to two days. It is our experience that primary rupture is only rarely fatal. I have seen it but once and then in a case where operation could not possibly have been done in time to save life. Repeated hemorrhage may be fatal but cannot occur until the patient reacts to a point beyond our operative requirements.

Preoperative treatment was absolute rest, ward screen, exclusion of visitors, shock position, and complete morphine immobilization: one-half grain on admission, often a quarter within the hour and another quarter every three or four hours. (Respiratory depression hastens reaction.) External heat, no stimulation, no enema. Hypodermoclysis with Ringer's solution we have found very valuable, and, on account of its slow absorption, not all contraindicated. Ten patients were transfused before operation.

The operative procedure was removal of one tube only in 75 cases, tube and ovary in 36 cases, both tubes in 6 cases and hysterectomy in 2 cases of interstitial pregnancy. In 1 case it was possible to remove the ovum from the tube and resuture. In 4 cases the appendix was removed also. There was no routine inspection of the other tube, as operative speed is essential. Whenever possible, traction on the uterus was maintained until the lesion was found. Blood was not removed in any case; only the large clots were taken out. Once we left clots too, but in 4 cases pelvic

abscess delayed convalescence. No curettage. Posterior colpotomy was never done; it is unnecessary and dangerous.

#### SUMMARY

1. Detailed history is of first importance in diagnosis.
2. Not vaginal examination alone, but

complete survey of the patient should follow the history.

3. Pain and bleeding are always present.
4. The pelvic mass and pain on cervical motion are almost always present.
5. There are many other confirmatory symptoms and physical signs.
6. Watchful delay before operative intervention will reduce mortality.



The pathological side of gynecology was studied very considerably by C. A. Ruge and Johann Veit (1852-1917), who described erosions of the cervix uteri (1877), by A. J. Skene working on the paraurethral glands in 1880, August Breisky on kraurosis vulvae in 1885, Max Sanger on decidual uterine sarcoma and other decidual tumors in 1886 to 1893, and J. Whitridge Williams on papillary cystoma of the ovary in 1891 and deciduoma malignum in 1895. Thomas S. Cullen contributed to the understanding of hydrosalpinx (1895), cancer of the uterus (1900), adenomyoma of the

uterus (1908), and diseases of the umbilicus (1916), and Georg Winter to gynecological diagnosis in 1866. Emil Noeggerath (1827-1895) first emphasized the importance of latent gonorrhea in women in 1872, and the general subject was developed by Ernst von Bumm (1885) and Max Sanger (1886), with the uterine and vesicle aspects (1895-6) by Ernst Wertheim. In 1874 Ephraim Cutter introduced treatment of uterine tumors by galvanism and Georges Apostoli first employed faradization in 1884.



# STERILITY

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**G**REAT as is frequently the calamity howl in the presence of an undesired pregnancy, this tragedy is rarely, if ever, greater than that which occurs when two seemingly healthy individuals united in happy marriage begin to fear that they cannot have the much-desired offspring.

The term "sterility" is not satisfactory, for many marriages that have been believed sterile by all concerned, including physician, have later resulted in healthy offspring. I have now under my care a woman who is pregnant for the first time, though married eighteen years. When then call a union sterile? Certainly time is not the determining factor, and no union can be called sterile unless some definite pathological condition is found in one or both participating parties that absolutely excludes the possibility of conception. It would be much better to consider the subject under the title of "relative fertility." I have a patient who during fifteen years of marriage has conceived six times: every time that contraceptive methods were not used. We also can and must consider under this general title cases of so-called one-child sterility; couples who after having one child find that the next conception does not take place when desired. This is not sterility, but certainly is lowered fertility, or relative infertility.

When the patient presents herself complaining that though she has been trying for a shorter or longer time to become pregnant, she usually asks, "Doctor, what is the matter with me?" Then is at hand the first important step to be taken in the study of the case. She must be reminded that it takes two to accomplish a successful conception, and that the husband's spermatozoa and their viability in her vaginal

secretions may have to be studied. She must be shown that the trouble may rest there, or that the course of the ovum from the ovary through the tube may be obstructed, or the trouble may be elsewhere at a distance from the genital organs, as in a disturbance of nutrition or in the organs of internal secretions.

First of all comes a careful history: Previous illness, and any rapid loss or rapid gain of weight; menstrual history, age of onset, regularity and amount; dysmenorrhea, and the type of dysmenorrhea must be studied; a delicate matter, but none the less important, that must then be considered is the method of coitus. It is surprising how often this will be found to be faulty.

This completed, a physical examination of the woman's genitals must be made. At such physical examination we first note the quantity of vaginal secretion, its chemical reaction (acidity), then the quality of the secretion. If it is more than a moisture, its color and tenacity are important. Then its location: does it seem to occlude the cervical canal, or does it come from the cervix? Next note the position, size and mobility of the uterus. If the uterus is very small we must decide whether or not it is infantile. Just a small uterus means little or nothing, but if the intravaginal portion is definitely as large as the intra-abdominal portion we have a true infantile uterus, and conception cannot occur.

Though many women with marked retroflexion become pregnant, straightening of a retroflexed uterus frequently facilitates conception. The presence of fibroids is of course important; the more nearly the fibroid encroaches on the uterine canal the more it is likely to interfere with

## Hellman—Sterility

the reception of the impregnated ovum; and this is certainly a definite etiological factor in some abortions. Next the tubes and ovaries are to be palpated. If the tubes are thickened and tender the likelihood of their being occluded is evident. If the ovaries are enlarged and tender they may be at fault. When the ovary has become one big cyst it is unlikely to give off ova, and if enveloped in adhesions the opportunity for the cast-off ovum to reach the tube is small.

This brings us to the study of the pelvic cellular tissues and their inflammatory states. Tenderness on examination is the most frequent objective symptom, and in the milder forms of inflammation, the best way of eliciting this tenderness is to exert pressure on the posterior surface of the cervix, pushing the cervix forward, and thus placing the uterosacral ligaments on the stretch. These ligaments are frequently the first structures involved in a pelvic inflammation. Thickening and tenderness of the tubes themselves must of course be looked upon as suspicious, and if these tubal enlargements are sufficient to diagnose a pyosalpinx, pregnancy will not take place until the condition is cured, and only then if the cure does not result in sealed tubes as an aftermath of the inflammatory state.

Having proceeded thus far and not feeling that the inability to conceive is sufficiently explained by the findings, next make arrangements with the patient for the further necessary examinations. Instructions must be given for proper methods of intercourse to be exercised in the interim. A rest period, that is, at least ten days without intercourse, is valuable. The most likely time for a woman to conceive has been found to be shortly after a menstrual period, and intercourse at this time and following the ten-day rest period is important. If the semen has the tendency to run rapidly out of the vagina after intercourse, the placing of a pillow under the woman's buttocks, producing a moderate Trendelenberg posture, may be a help. Remaining very quiet in this position for some time,

and abstaining from douching is advised. Extreme external rotation of the thighs during intercourse is also of importance. If the secretions are overacid a bicarbonate vaginal douche six to twelve hours before intercourse and bicarbonate internally and an antacid diet are recommended.

Next comes a study of the spermatozoa. Unfortunately, the ova cannot as yet be investigated. The spermatozoa are best examined as deposited by natural intercourse in the vagina. Of course this study must start as shortly after intercourse as possible. When the patient lives very near the doctor, intercourse at home and a hurried trip to the office may suffice.

A few drops of the semen are removed from the vagina with a sterile platinum loop, placed on a warmed glass slide and examined at once. The number and the motility of the spermatozoa are the important things to be noted. They must be many and actively swimming across the field of vision to be considered normal. Work on the shape and size of the spermatozoa is now being done by many, but as yet is of no practical value. If the first examination shows the spermatozoa normal the male contracting party is probably normal. The examination of the spermatozoa from the vagina must be repeated several times, and at the end of forty-five minutes after the intercourse the spermatozoa should still be active. If the spermatozoa are active and alive at the end of about forty-five minutes then the male is normal and the sperm cells able to resist the vaginal secretions a sufficient length of time. If the spermatozoa are active at the onset and rapidly lose this activity the fault is probably in the female secretions, but of course may be due to some inherent weakness of the male element.

All the above-described examinations having resulted in failure to reveal the possible cause of the sterility, we must then arrange to test the tube patency. For this we have today two methods, namely, the transuterine insufflation of the tubes and peritoneal cavity with air, oxygen or car-

bon dioxide, and the roentgen-ray examination. Both tests are contraindicated by the presence or suspicion of a pelvic inflammatory condition; the more acute the inflammation, the more marked the contraindication. The insufflation is more dangerous in the presence of pelvic inflammation than the roentgen-ray examination. Though many modifications have been suggested for transuterine insufflation, I still use the technique practically as originally described by Rubin, to whom great credit is due for bringing to our attention this great advance and simple method for the study of tube patency. After excluding all pelvic inflammations, the cervix and vagina are carefully wiped with full strength tincture of iodine, and under full aseptic precautions a cannula is introduced into the cervix, and its other end connected with an oxygen tank through a mercury manometer. The cannula has a rubber guard that fits over the cervix preventing leakage of the gas used through the cervix alongside the cannula. The oxygen is then allowed to flow very slowly and the manometer most carefully observed. If the readings of the manometer scale do not go above 140 mm. of mercury pressure and there is no leakage, a few seconds will suffice to pass enough oxygen into the peritoneal cavity to prove the patency of the tubes. The pressure as read on the manometer must never be allowed to go above 200. On rising from the reclining position the patient will experience a severe sharp pain in the right shoulder, if sufficient oxygen has passed. The severity of the pain and the promptness with which this characteristic symptom appears will depend on the amount of oxygen passed through the tubes. This pain must appear to call the tubes patent, and is the crucial point of the test. Of course a roentgen-ray study can be made to see if any of the oxygen is present under the diaphragm. Formerly, if the oxygen failed to pass, the test was repeated two or three times at varying intervals during the menstrual cycle. Now, when the oxygen fails to pass, we should

proceed with roentgen-ray examination. Probably the reason for the gas not passing on one occasion but passing on another, is due to the sphincteric action of certain fibers at the uterine end of the tube. These fibers contract and close the tube when sudden sharp pressure is brought to bear on them. The advantage of transuterine insufflation is that it may at times open a closure caused by a matting together of the mucous membrane surfaces of the tubes.

Until recently roentgen-ray study of the cavity of the uterus and the tubes was impossible because we had no opaque substance that was not irritating to the uterus and dangerous if it reached the peritoneal cavity. Now there are a number of such substances on the market. I have used lipiodol (Lafay) with success and used it or seen it used in hundreds of cases without the least harm. Under the same surgical aseptic technique as that used in the transuterine insufflation and with a cannula similar to that already described, (except that its only opening is in the rounded tip, there being no side openings), 5 c.c. of the lipiodol is slowly injected into the uterine cavity. Without removing the cannula, stereoscopic pictures are made; the whole procedure having been performed on the roentgen-ray table as in making pyelograms. The cannula is then removed and another roentgenogram is made. It is a good plan to make a final uterogram after a week, for then if the tubes are wide open a certain quantity of lipiodol will still be found in the pelvic peritoneal cavity. Though this method will not open every kind of closure of the tubes its chief advantage is that the sphincteric action at the uterine ends of the tubes will not keep the lipiodol out, and when the tubes are closed it will show the point of closure, a most important matter in determining the indications for operative procedure.

According to some recent work by Kurzrok and Miller, done at Columbia University, some of the unexplained cases of sterility may be due to an absence in the

## Hellman—Sterility

semen of certain lytic properties which exist in the normal male and have the power to dissolve the cervical plug of mucus and thereby facilitate the entrance of spermatozoa into the uterine cavity.

The treatment of sterility consists in removing if possible the etiological factor responsible for the condition. If the male is at fault the cause in him must be found, and if possible, treated. If he is unable to have normal intercourse it may become wise to inject some of his semen into the uterus with a proper syringe. Thick vaginal discharges must be cured and overacidity lessened.

Tumors must be removed if they seem to stand in the way of fertilization. Pelvic inflammatory conditions must be treated, preferably by diathermia and other palliative measures, because the radical operative treatment is likely to make the sterility more absolute. Removal of the inflamed tissues is likely to include removal of the tubes or ovaries or both.

Where the tubes are sealed the possibility of opening them must be considered. When sealed at the uterine ends nothing can be done. Sellheim, however, has recommended an elaborate surgical procedure for this condition, but as yet it promises little.

The nearer the obstruction comes to the fimbriated ends of the tubes the more hopeful becomes the possibility of accomplishing something by surgery. At laparotomy the tube is opened, or the closed end cut off, and a cuff  $\frac{1}{8}$  to  $\frac{1}{4}$  in. turned back and sutured so as to prevent reclosure. Not enough investigation has been done on the results of this operation to warrant giving percentage figures; but where offspring is greatly desired and there is no

cause found that might explain the sterility except a closure of the fimbriated ends of the tubes, this operation is a safe and sane procedure and gives some hope.

## CONCLUSIONS

Inability to have offspring frequently borders on tragedy; and by careful study many patients can be transferred to the category of lowered fertility and have one or more children. Study of the cases includes the male as well as the female. Examination of the female includes a careful history of the sex life of the individual and her menstrual history and general and endocrine health. Physical examination includes bimanual examination for arrests of development and misplacements, tumors and inflammations (even those of lower grades). Other important points include examination through a speculum with a study of the kind and amount of the vaginal secretions, tube patency tests with transuterine insufflation, and where this is unsuccessful, roentgen-ray examination of uterus and tubes. Study of the spermatozoa and their ability to remain alive in the vagina may not be omitted. It would be useless to open a tube where the spermatozoa of the male are absent or dead. Finally, remove the cause where possible. This may entail tumor removal, as of a polyp, straightening out a retroflexion, dilating a cervix, especially in the presence of a severe dysmenorrhea, eradicating a thick cervical discharge or altering the reaction of the vaginal secretion. Inflammations of the pelvis are, as a rule, best treated conservatively. Tubes closed at the fimbriated end can in some cases be permanently opened and pregnancy ensue.



# URETEROVAGINAL AND VESICOVAGINAL FISTULAE, COMBINED

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URETEROVAGINAL and vesicovaginal fistulae are both fairly frequent, but the combination of the two is rare. In a search of the Quarterly Cumulative Index, for the past eleven years, no such case was listed.

As my 2 cases were the result of operation, a consideration of the subject will be

determine which is responsible. A mental review of the operation may enable one to account for the cause. At times, one may clamp a ureter, recognize the error, and remove the clamp or the ligature and later have a leakage as a result of the necrosis so engendered. The dissection of the ureter from its attachments for a considerable

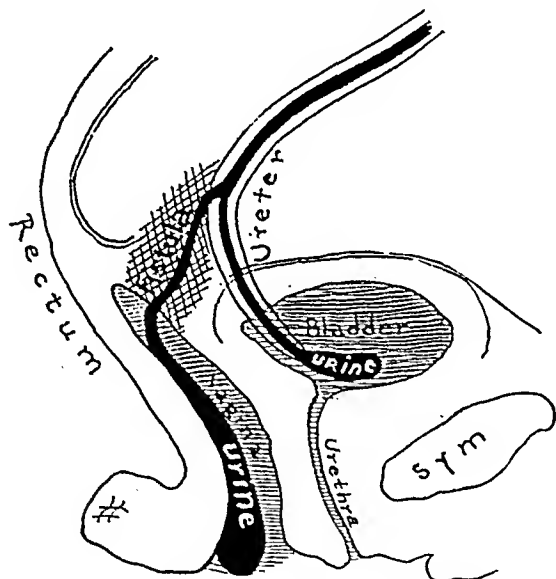


FIG. 1. Ureterovesical and vesicovaginal fistulae, combined.

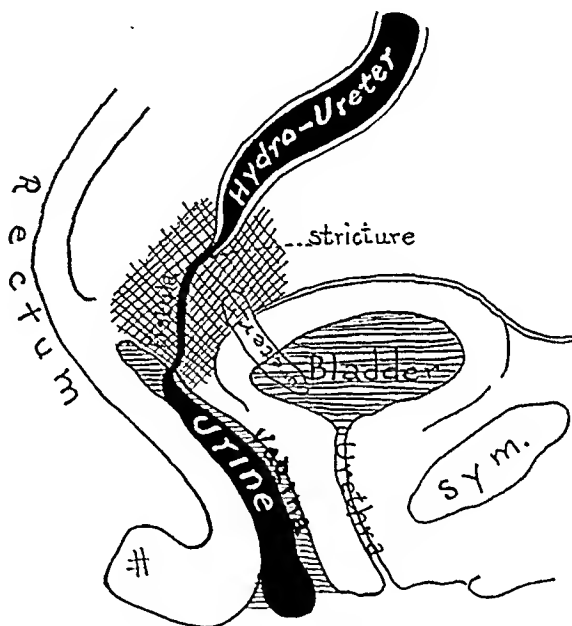


FIG. 2. Ureterovesical and vesicovaginal fistulae, combined.

discussed only from the viewpoint of operative trauma as a cause of the condition.

There are 3 principal causes for this operative complication. 1. Direct operative incision of the ureter and the bladder. 2. Necrosis of the ureter and the bladder as a result of clamping or suturing. 3. Necrosis from interference with the blood supply. The majority of the fistulae that I have seen have resulted from the last 2 causes. It is possible that the ureteral injury may be due to one of these causes and the bladder injury to another. It is often difficult and many times impossible to

distance may so damage the blood supply that the ureter may become necrotic.

The fistulae that result from direct opening of the bladder or ureter manifest themselves by a leakage that begins at once, except the instances where the injury has been recognized and repaired immediately; if the repair is not successful the leak begins a few days after. The fistulae resulting from causes enumerated in 2 and 3 do not occur until the necrotic tissue gives away, usually a week to ten or more days afterwards.

The operations that are most frequently followed by fistulae are those that are

technically difficult, such as large, impacted uterine or ovarian growths, pus tubes, and those requiring an extensive dissection of the parametria with freeing of the ureters. Intraligamentous (broad ligament) growths are apt so to distort the normal anatomy that the ureter may be displaced and easily injured.

The usual history is that a week or ten days after operation there is complete or incomplete incontinence of urine, usually coming on suddenly. The first thought is

the fistula, indigo carmine is given intravenously and the elimination from the two sides observed. Failure to appear on one side indicates a lesion, which except in a few instances of damage that was present before the operation, is most probably due to a ureteral injury. Catheters are then passed on both sides to determine the point of injury and to collect a specimen of urine from the uninjured side. In a few of the instances where there has been a side wall injury of a ureter there is a discharge of

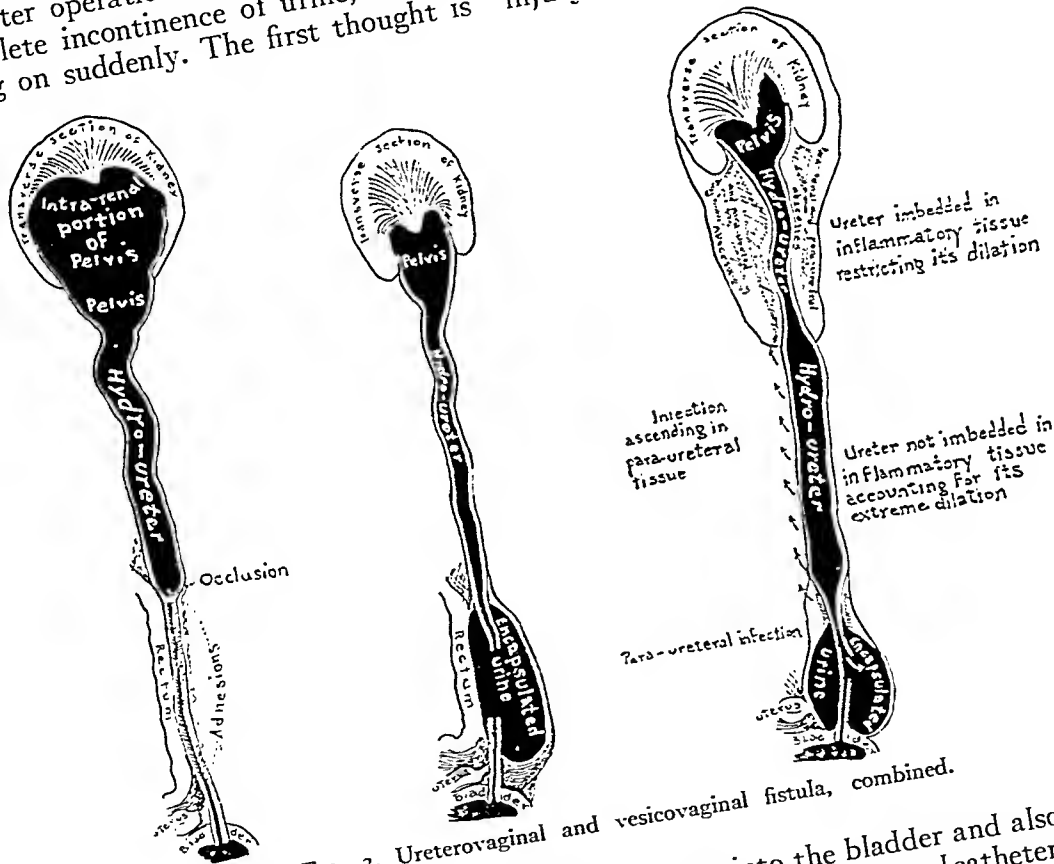


FIG. 3. Ureterovaginal and vesicovaginal fistula, combined.

that of a vesical fistula, and the complication of a ureteral injury is rarely considered. So soon after operation a thorough examination is often impractical.

In every case of vesicovaginal fistulae, the result of operation, the possibility of a concomitant ureteral injury should be considered. Even with a fairly large vesical fistula a good view of the bladder may be had through a water type of examining cystoscope, especially one in which continuous irrigation is possible. After locating

urine into the bladder and also outside. In such a case the ureteral catheter may pass up the ureter without meeting an obstruction. It must be remembered that the distance from the ureteric orifice to the obstruction point does not necessarily indicate the point at which the ureter was injured, as the upper segment may have retracted several centimeters. Methylene blue injected into the injured ureter through the ureteral catheter can sometimes be detected flowing into the bladder. Coidan in the

Necker Clinic (Paris) has been able to detect ureterovaginal fistulae by pyelo-ureteroscopy, using 20 per cent sodium iodide.

Having determined that a ureteral fistula does exist the next step is to locate its opening into the vagina and if possible to catheterize it to gain an idea of the kidney function, the amount of ureter and pelvis dilation, and the presence or absence of infection.

To locate the ureteric opening in the

vagina is that of the sinus leading from the end of the ureter and it may be several centimeters long. Unfortunately, it is seldom possible to catheterize such a ureter, and the specimen must be obtained by placing at the fistula orifice a Kelly speculum, or aspirating the urine that collects in the vagina, after placing a catheter in the uninjured ureter. Complicating a ureteral injury there is usually a marked inflammatory exudate around the sinus that leads from the end of the ureter to the

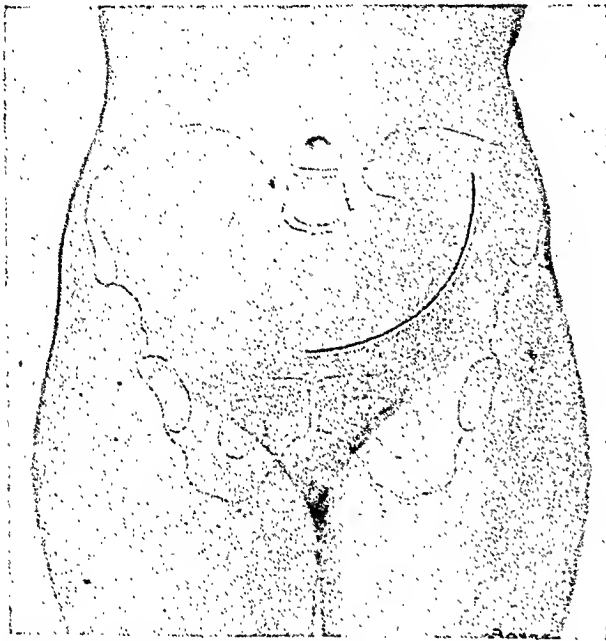


FIG. 4. Outline of incision. From 1 inch above symphysis upwards and outwards to a point 1 inch external to anterior superior spinous process of the ilium.

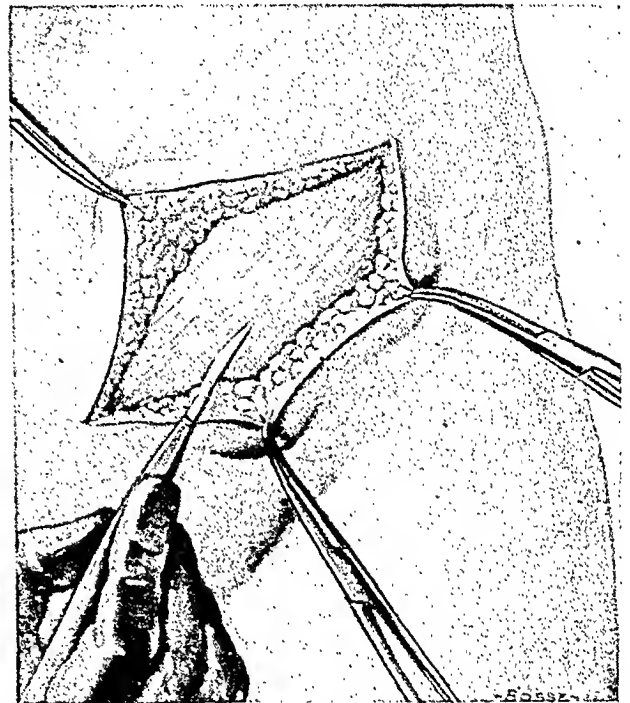


FIG. 5. Incision through skin. Fibers of external oblique to be separated.

vagina, the patient is put in the left or right Sim's posture, the injured side being uppermost, and the perineum retracted with a Sim's speculum. The knee-chest posture is more desirable if the patient is strong enough to retain it for a sufficient length of time. The previous administration of indigo carmine, intravenously, makes the search easier. The vagina may be dried with cotton pledgets, though a motor driven aspirator is desirable.

A pyelo-ureterogram is useful, not only in showing the degree of dilation but also in locating the lower end of the upper segment of the ureter. The opening into the

vagina. A local abscess may form here, there may be an ascending periureteral infection, extending even as high as the kidney. Sooner or later there is ureteral dilation, extending to and involving the pelvis and calyces of the kidney. Pressure atrophy of the cortex, and pyonephrosis are possible results. The illustrations which I have borrowed from an article by Dr. John A. Sampson show these complications very clearly.

#### TREATMENT

If the ureteral injury is not complete, that is, a side wall injury, a ureteral cathe-



ter is passed to a point above the injury, and allowed to remain several days; this may result in a closure of the ureteral fistula, and simplify matters by giving us only a vesicovaginal fistula to deal with. With a complete ureteral fistula, we must determine if conditions warrant an attempt to implant the ureter into the bladder. Marked infection of the ureter and the kidney pelvis, marked loss of function, and a ureter that cannot be easily brought into the bladder, are contraindications to an

been absorbed and before injury to the kidney has resulted from obstruction of the sinus leading from the lower end of the ureter, or infection has developed.

Except in the instances where an abdominal repair of the vesical fistula by the transvesical route is to be done, I believe the wise procedure is the division of the work into two operations, the first being the ureterovesical anastomosis. The presence of the vesicovaginal fistula is an advantage as regards the success of the

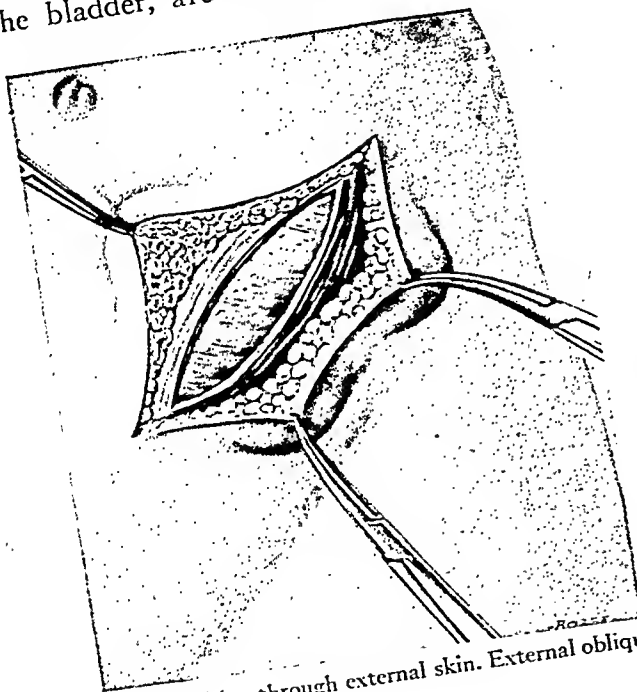


FIG. 6. Incision through external skin. External oblique shown.

anastomosis. Ureterovesical anastomosis is often difficult, risky as regards life, and more risky as regards success, so except under favorable circumstances, I feel the best interests of the patient makes nephrectomy the better procedure. An immediately successful anastomosis is often followed by a stricture of the ureter with consequent dilation of the pelvis that may become infected and eventually necessitate a nephrectomy. If an anastomosis is to be done, the operation should be performed as soon as possible; that is as soon as the exudate that is nearly always present about the lower end of the ureter has

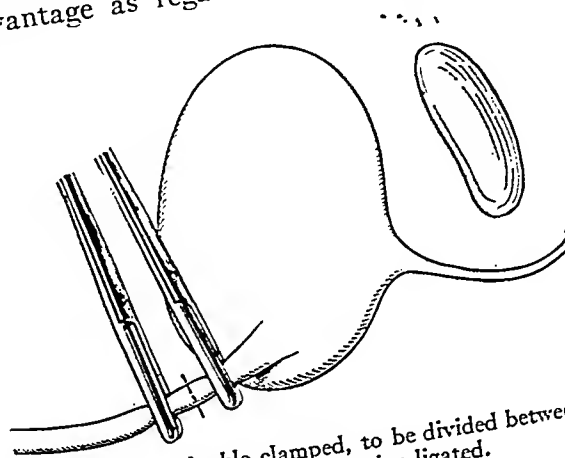


FIG. 7. Ureter double clamped, to be divided between clamps, the caudad portion ligated.

anastomosis, in that it affords excellent bladder drainage. The closure of the vesicovaginal fistula is not done until thorough healing of the ureterovesical anastomosis. The following is a technique that I developed in 1917, and that I have found quite successful.

#### TECHNIQUE

A one-sided Pfannenstiel incision gives good exposure. This starts at the anterior-superior spine of the ilium and 1 inch to its inner side and passes downward in a curved direction to the midline, or just beyond,  $1\frac{1}{2}$  inches above the symphysis. The fibers of the external oblique are divided in the same direction, as are also those of the internal oblique; these latter are necessarily cut somewhat obliquely. The transversalis fascia has to be divided with a sharp knife and with extreme care, or the peritoneum will be opened. Should the

peritoneum be opened, the operation is made technically easier by separating it from the transversalis fascia before closing it. After the line of separation of the transversalis and the peritoneum has been struck, the peritoneum is peeled by blunt gauze dissection from the lateral and then the posterior pelvic wall, the iliac vessels being nicely shown. After these come into view a search is made for the ureter on the peritoneal reflexion (and not on the posterior pelvic wall).

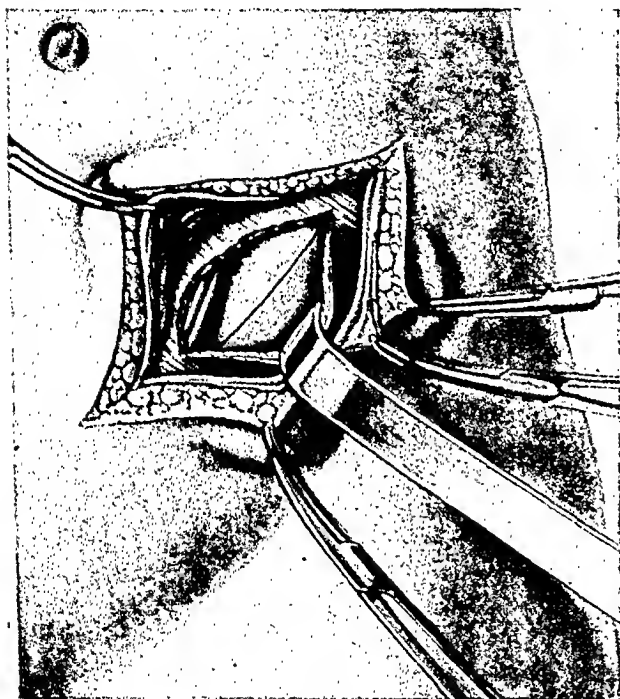


FIG. 8. External and internal oblique have been divided. Deep on the inner side is seen the rectus. The line shows the direction in which the transversalis fascia is to be incised. (In practice the internal oblique is divided more extensively than is here shown.)

In these cases it is usually easily found, because of the almost constant thickening and dilation; often this is so great as to mislead one. I know of a surgeon who looked for two hours for ureters that were directly in sight because he failed to identify the greatly thickened structures as ureters. Should doubt exist, it can often be expelled by so irritating the ureter that it will call forth its characteristic vermicular action. Should the fistula follow a hysterectomy the exposure is simplified because of the obliteration of many of the

pelvic vessels, though usually these are not troublesome, the operation being sometimes done without the ligation of a single vessel. After locating the ureter, usually near the pelvic brim, it is best to clasp it with a pair of Allis clamps, in such a way that the teeth come together around the ureter and so do not injure it. By applying these clamps successively lower and lower and using blunt-gauze dissection, the lower end of the ureter is easily reached, or the point where the divided ureter enters the scar tissue

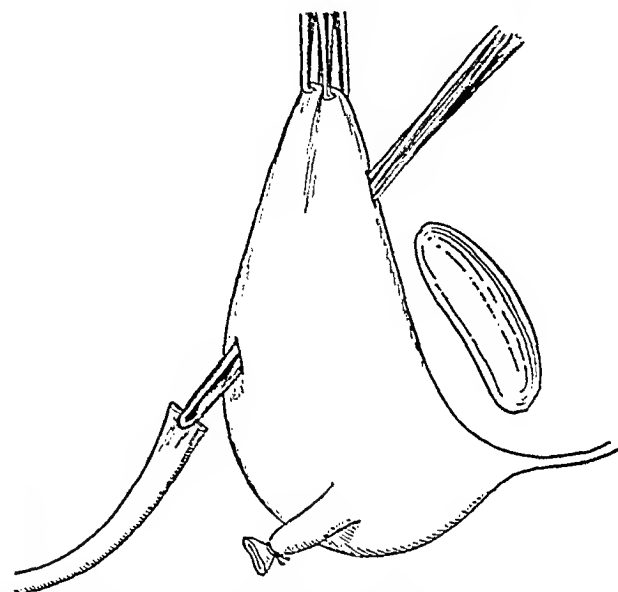


FIG. 9. Bladder elevated with 2 Allis clamps. Forceps have been passed through and the cephalad portion of the ureter grasped in the forceps.

that is always around the fistula. Occasionally it is necessary to double ligate and divide the uterine artery, to gain better access to the lower end of the ureter, but this can as a rule be done without trouble. All small bleeding vessels should be controlled with ligatures, for the best work can be done only in a field free from blood. The ribbon form of retractor aids materially in exposing the operative area.

The ureter should not be freed from its sheath or the peritoneal reflexion except for the inch that it is to pass into the bladder, for such separation from its attachments imperils the blood supply and the nutrition of the ureter. When a suitable point for division of the ureter is determined and attained it is double clamped and cut. The lower end is ligated, not so

much to prevent the leakage of urine from the bladder, as to control a small vessel that is usually found in the sheath just under the ureter. The upper portion of the ureter is then dissected free of all attachments for 1 inch or for  $1\frac{1}{4}$  inches; this

lower angle of the wound; deep bites about 1 inch apart are taken with weak Allis clamps. By making traction on the clamps a double layer of the bladder is brought up in the lower portion of the wound. A sharp pair of artery forceps is then pushed

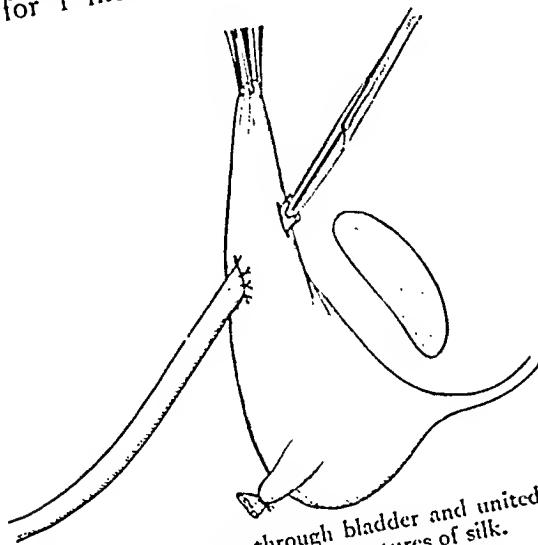


FIG. 10. Ureter drawn through bladder and united to posterior wall by separate sutures of silk.

limited dissection I believe to be of great importance in conserving the nutrition of the ureter.

Should there be difficulty in bringing the ureter and the bladder together, the

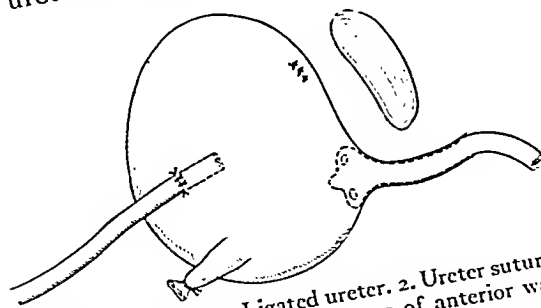


FIG. 11. This shows: 1. Ligated ureter. 2. Ureter sutured to bladder. 3. Closure of puncture of anterior wall. 4. Retention of catheter in bladder.

bladder may be mobilized by freeing the attachments on that side.

There are numerous methods of making the union between the bladder and the ureter, but the following is the one that I have found most satisfactory. The nearest portion of the bladder is located in the

through both these walls, entering anteriorly and emerging posteriorly, the forceps is thus made to enter and pass out of the bladder. The bite of the ureter held in the forceps is then transferred to the forceps that has passed through the bladder, when by traction on this forceps the ureter is drawn into, and again out of the bladder. While held in this position the ureter is stitched where it passes through the posterior bladder wall, with 4 or 5 interrupted sutures of fine silk. Care is taken that 1 of these includes the sheath of the ureter where the free dissection ends. This prevents the pulling of the ureter out of the bladder. The forceps on the end of the ureter is then removed, as are also the 2 used to elevate the bladder. By then picking up the anterior wall of the bladder with another pair of forceps and drawing it forward, the free end of the ureter is made to slip into the bladder cavity. The opening into the anterior wall of the bladder is closed with a running stitch of fine chromicized catgut.

This method of making the opening in the bladder I believe is preferable to the

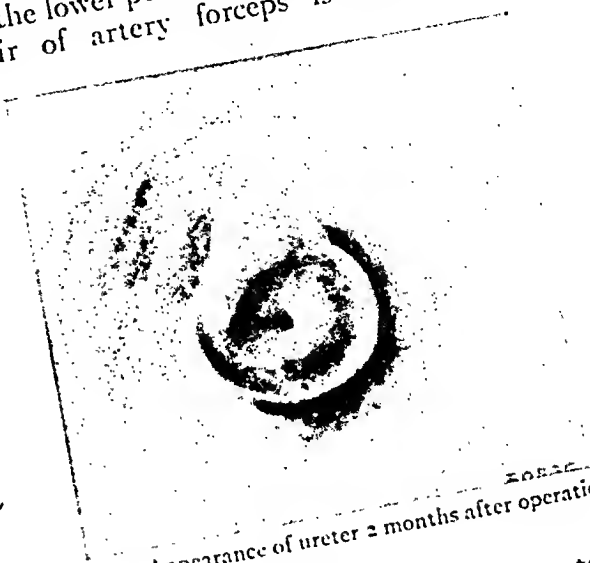


FIG. 12. Appearance of ureter 2 months after operation.

one in which forceps are passed through the urethra to accomplish the same purpose, as that necessitates another assistant and the disarrangement of the patient and the operative field without offering an advantage. The puncture method I believe better than making an incision into the bladder, which I have always found rather difficult. It is usually found that the opening made by incision is larger than anticipated or desired and even though it can be sutured, I think the chances of good union are lessened.

If there appears to be any traction on the line of suture, it is well to attach the bladder near the point of anastomosis to the lateral pelvic fascia.

A rubber tissue drain is inserted into the wound beneath the transversalis fascia, but does not come in close approximation to the anastomosis. Even though the wound looks dry, there is much serosanguinous leakage for the first seventy-two hours, at the end of which time the drain is removed. The wound is closed in layers with fine chromicized catgut and Michel clamps on the skin.

A Pezzer retention catheter is placed in the bladder for seven to eight days. The patient is put on monobasic sodium phosphate 20 grains, three times daily before meals and urotropin 15 grains, three times daily after meals a few days before operation. This is resumed as soon after operation as the stomach will permit and continued well after the time the catheter is removed. The catheter should be removed daily for cleansing as a stoppage may wreck the operation; the bladder should be irrigated with boracic acid solution twice a day.

The chances for union between the bladder and the ureter are claimed to be greater when the operation is done as an intraperitoneal procedure, but I believe the greater risks of an infection that will carry the patient off are more than counter-balanced by the safety, as far as life is concerned, of the extraperitoneal operation.

## SUMMARY

1. The combination of a ureterovaginal fistula and a vesicovaginal fistula is rather uncommon.

2. The operative procedure should first care for the ureteral part and later for the vesical.

3. Except in favorable cases nephrectomy is a safer and wiser procedure than an anastomosis of the ureter into the bladder.

4. A primarily satisfactory anastomosis may prove a delayed disappointment as often the ureter becomes strictured, with subsequent ureter and pelvis dilation, renal atrophy, or infection.

## CASE REPORTS

**CASE I.** Miss A. R., aged forty-eight years. In August 1919, patient had a complete hysterectomy for a large impacted fibroid. Immediately following the operation there was incontinence of urine. When first seen by me in September, 1919, examination showed a vesicovaginal fistula  $\frac{3}{8}$  in. in diameter just to the left of the median line and  $\frac{3}{4}$  in. behind the trigonum. There was no urine coming from the left ureteral meatus. A catheter inserted into the ureter met an obstruction at  $1\frac{1}{2}$  in.

After intravenous injection of indigo carmine, the sinus from the left ureter was detected in the vault of the vagina on the left. The dye excretion was strong, and the urine collected was pus free.

On October 30, 1919, the ureterovesical anastomosis was successfully performed according to the technique described above. The ureter was dilated to the size of a lead pencil.

On June 12, 1920, the vesicovaginal fistula was closed.

The patient was seen on September 20, 1927. Indigo carmine was eliminated strongly from both ureters, the urine was pus-free. I was not able to catheterize the implanted ureter. Phenolsulphonphthalein elimination was 35 per cent in seventy minutes after intravenous injection. Blood pressure was 250 systolic, 150 diastolic.

**CASE II.** Mrs. S. W., aged thirty-one years, married, with one child five years old.

In December, 1926, patient had pan-hysterectomy for fibroids.

Eight days after operation she developed complete incontinence of urine. During April, 1927, she ran a temperature of 100°F. to 102°F., with pain in the right kidney region.

When she consulted me in May, 1927, examination showed a vesico-vaginal fistula  $\frac{3}{8}$  in. in diameter in the midline,  $\frac{1}{4}$  in. back of the inter-ureteric line. Catheter passed in the right ureter was obstructed at  $\frac{1}{2}$  in. Indigo carmine eliminated from the left, but none was seen coming from the right. The patient was then put in the left Sim's posture, and the indigo carmine was seen coming from a small sinus high in the vaginal vault. The intensity of the color was approximately  $\frac{1}{2}$

of that of the left side. A moderate number of pus cells were found in the urine from the right side (collected from the vagina with a pipette).

Diagnosis: Ureterovaginal and vesicovaginal fistula.

On June 1, 1927, the right ureter was implanted into the bladder according to the technique given above.

The ureter was dilated to a size slightly larger than a lead pencil.

On September 16, 1927, examination showed that this had been successful.

She is to have the vesicovaginal fistula operated upon in the near future.



"Important features of the pre-antiseptic period were the artificial induction of premature labor by Carl Wenzel (1804), the use of ergot by John Stearns, of Massachusetts (1808), the suggestion of chlorine water to prevent infantile conjunctivitis by Gottfried Eisenmann (1830), the establishment of the contagiousness of puerperal fever by Holmes (1843) and Semmelweis (1847-61), the first findings of albuminous urine in connection with puerperal convulsions by John C. W. Lever, of Guy's Hospital (1843), Credé's Handgriff (1854), the introduction of combined cephalic version by Marmaduke Burr Wright, of Ohio (1854), and of combined podalic version by Braxton Hicks in 1864. In the early part of the century, the two French midwives, Mme. Boivin (1773-1841) and Mme. La Chapelle (1769-1821), published noteworthy treatises on obstet-

rics (1812 and 1821-25). Mme La Chapelle's book, with its statistical deductions from 40,000 labor cases, had a good deal to do with the establishment of a proper norm or canon of obstetric procedure at the time. It was followed by such works as those of Velpeau (1829), Cazeaux (1840), and Dubois (1849) in France; Caspar von Siebold (1841), Michaëlis (1842), Kiwisch (1851), Scanzoni (1852), and Carl Braun von Fernwald (1857), Otto Spiegelberg (1858), in Germany and Austria; Fleetwood Churchill (1834) and Francis Henry Ramsbotham (1841) in England; W. P. Dewees (1824), Charles D. Meigs (1849), Hugh L. Hodge (1864), and W. T. Lusk (1882) in America. The best recent American treatise is that of John Whitridge Williams (1903).—F. H. GARRISON in "An Introduction to the History of Medicine."

# A STUDY OF THE FACTORS INFLUENCING MORTALITY AND MORBIDITY FOLLOWING GYNECOLOGIC LAPAROTOMIES

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THE quality of an operator was formerly, and is to some extent even at present, judged by the complexity of detail in his procedures. It was a matter of pride for the operator to build up an elaborate program of treatment, every detail of which must be executed at an exact time and in an exact manner. Such a program defeated its own ends in that time was wasted, the energy of attendants misspent, and the patient's morale and actual physical condition seriously undermined. Observing these things, the writer undertook to evaluate, by use and omission, various procedures: with a view to eliminating non-essentials, and simplifying, to the greatest extent compatible with maximum efficiency, the management of gynecologic operative cases. These experiments were carried out on the private and personally operated clinic patients of the writer. A basis of comparison was afforded in the patients of other operators, whose cases were conducted in the orthodox manner of the time. It was very easy to discard many traditional details at once; other details required much study before they could be evaluated; and a few procedures of obvious practical value seem even now actually illogical. In the course of time a set of principles was evolved. The application of these principles has been attended by a marked reduction, and their violation by an immediate increase, of postoperative morbidity and mortality. The present study was undertaken for two purposes: first, to check statistically the accuracy of observations in regard to the various

factors involved; and second, to attempt to classify the causes of mortality as avoidable and unavoidable with a view to eliminating the former as far as possible. The charts of 4500 consecutive patients subjected to laparotomy for gynecologic lesions was reviewed, and the cases of postoperative morbidity and mortality carefully studied. All gynecologic laparotomies of the period were included, and the lesions comprise almost the whole range of gynecologic disease; except that laparotomies for cancer of the cervix were omitted on account of the gradual substitution of radium treatment for the Wertheim operation and the Percy heat treatment. To include these would obscure to some extent the real objects of the study. The great majority of the patients were charity clinic patients, in most of whom advanced and neglected conditions existed. In cases of this sort the disorganization of the pelvic structures, the involvement of intestine, and the reduced resistance of the patient tend to make the mortality much higher than in the case of private patients, who come to operation with much less advanced lesions and in better general condition. The writer has been fortunate in that he has had ample opportunity to assist and to observe the technique of every major operator whose work is included; of having acted as principal or as assistant in all but a relatively small number of operations in the last 3500 laparotomies of the series; and of having been in direct charge of the preoperative and postoperative care of all the patients involved during the same period, except

the relatively small number of private cases of other operators.

Taking asepsis for granted, the factors found to be of major importance in reducing mortality and morbidity may be listed as follows:

### I. Selection of cases for operation.

A. Avoidance of laparotomy in the active stage of infection of the genital tract.

B. Rigidly thorough general examination of the patient for temporary or permanent contraindications to operation, with appropriate consultation in regard to doubtful points.

### II. Preoperative care.

A. Avoidance of preoperative purgation.

B. Maintenance of a normal supply of nutrition and water as nearly up to the time of operation as possible.

C. Psychologic management, rest, and the reduction of emotional elements, especially of fear.

### III. The operation.

A. Selection of the anesthetic: Will the risk from the particular morbid conditions in this case plus the risk from the anesthetic be least with ether, with the gases, or with local or spinal novocaine?

B. Technique.

1. Elimination of wasted time.

2. Gentleness.

3. Thoroughness.

4. Protection of uncontaminated areas from infection.

5. Completion of essential procedures as they arise.

6. Conservation of warmth.

### IV. Postoperative care.

A. Rest.

B. Adequate supply of fluid (water).

C. Rational supply of food substances.

After careful consideration the writer has classified the causes of postoperative death as represented in this series as follows:

CONDITION	AVOIDABLE	UNAVOIDABLE
Ureteral occlusion	All cases	
Peritonitis and sepsis	Nearly all cases	A few cases
Shock		
Hemorrhage		
Adynamic ileus		
Cardiac failure		
Uremia		
Infection of respiratory tract (except embolic infection)		
Hyperthyroidism		
Diabetes		Some cases
Acute gastrectasis	Most cases	
Mechanical ileus		
Perforation of intestine		Nearly all cases
Thrombosis	A few cases	
Embolism		
Acute yellow atrophy of liver		All cases
Sporadic cryptogenic infection (gas bacillus, etc.)		
Encephalitis		
Bacillary dysentery		

Five deaths occurred without cause discoverable at autopsy. In 3 of these the Wassermann reaction was + plus with both antigens; the other 2 occurred before the institution of the routine Wassermann. On this account we no longer operate upon patients with + plus Wassermann reaction (except when urgently necessary) until after thorough antiluetic treatment has been carried out.

### PERITONITIS AND SEPSIS

The present rules of the service in regard to acute pelvic infection (streptococcus infection excepted) are as follows:

1. No case of pelvic infection is to be subjected to laparotomy until the temperature has been normal for seventy-two hours, and does not rise after an examination by an instructor and two students: (a) except when a definite abscess is palpable through the abdominal wall and cannot be reached by posterior colpotomy. In these cases a short incision is made directly over the abscess, as low as possible, and drainage effected without opening into the peritoneal cavity beyond the zone of adhesions if this is possible; if impossible, the free cavity is carefully



walled off with a gauze dam before opening into the abscess proper.

2. Patients whose temperature does not subside within twenty-four hours after the institution of appropriate treatment are examined daily, very gently, by an instructor: if any abscess which can be reached by colpotomy is found, this operation is done at once (see above).

3. If fever does not subside in seventy-two hours, colpotomy is done, with very cautious digital exploration of the pelvic cavity for collections of pus which were not palpable on ordinary examination. In these cases pyosalpinges and infected cysts are opened by Hilton's method if this can be done without entering the abdominal cavity beyond the zone of adhesions.

4. Cases of recently active pelvic infection are drained by broad flat rubber dam drains at the conclusion of laparotomy for removal of diseased structures only when there are large areas of exposed and oozing tissue, when intestine or bladder has been injured, or when the field has been extensively soiled by serous or purulent exudate. In cases remaining within average temperature limits (under 100.6° F.) and without excessive drainage of blood or exudate the drains are removed in toto at the end of twenty-four hours. Otherwise the drains are removed at a rate of an inch a day, beginning seventy-two hours after operation.

Streptococcus and other tissue infections have been very rare, and for this and other reasons no definite value can be attached to our rule, which is as follows:

In known or suspected streptococcus infections operation is not done except after a period of several weeks of freedom from fever and leucocytosis, and in the presence of a normal sedimentation rate: except in the case of definite or incipient abscesses, which are drained by as direct an approach as possible, without attempting removal of diseased tissues.

Laboratory findings have proven disappointing as a guide to the proper time for operation in these cases. Two very high and constant leucocyte counts occurred in cases of uninfected ectopic pregnancy; there was no leucocytosis in many cases of pelvic suppuration in the febrile stage, and in these cases this did not represent a low resistance; there was no regularity at all in the findings in average cases. Polynucleosis varied somewhat more constantly with the severity of the infection. The sedimentation test has been positive in all cases of infection so far; but it was also positive in non-infected cases, the most rapid rate occurring in a case of ruptured pseudomucinous cystadenoma without infection. As a guide to the proper time for operation it was found impractical, as the return to normal requires a hospital residence far in excess of actual necessity and rational economic requirements.

The efficacy of the rules is shown by comparing the mortality rates in the following table:

TABLE I  
DEATH RATES FROM PERITONITIS FOLLOWING  
GYNECOLOGIC LAPAROTOMIES

	Per Cent
Service rate, all operators.	
First 3400 laparotomies (rules partly or not at all observed).....	2.23
Last 1100 laparotomies (effort at universal enforcement).....	0.73
<i>Every death in this last series followed a violation of the rules.</i>	
1215 laparotomies of operator X (rules not observed).....	2.83
400 laparotomies of operator W (rules partly observed).....	1.00
500 laparotomies of operator W (rules not observed).....	3.00
400 laparotomies of operator W (rules observed).....	0.25
<i>The sole death in this last series followed a violation of the rules.</i>	

#### SHOCK

We believe that the reduction of the incidence and of the severity of shock in our cases has been due to the following factors:

1. Elimination of wasted time in operation.

a. Prompt decision as to the operation required. Best accomplished by freeing and examining all affected structures before beginning any other procedure.

b. Standardization of technique. Steady progress to the completion of what has to be done on one side and then on the other without unnecessary switching from side to side. Observing a definite sequence of procedure. Securing all blood vessels before they are cut.

c. Elimination of lost motion. No gestures. A definite place on the tray for each instrument. Each instrument returned immediately to its place after use. Do all that has to be done with each instrument before laying it down.

d. Team work. Impossible without standardization of technique.

e. Cooperation with anesthetist.

f. Quickness of movement, a frequent source of loss of time unless under perfect control.

The effectiveness of the saving of time in operating is shown by the following.

TABLE II

DEATH RATE FROM SHOCK FOLLOWING GYNECOLOGIC LAPAROTOMIES

	Per Cent
First 800 laparotomies, all operators, average time over two hours.....	1.00
1215 laparotomies of operator X, same general methods, average time gradually reduced from one-hundred to fifty-five minutes.....	0.75

2. Gentleness. The earlier operators were extremely vigorous in their handling of viscera and in the packing-back of intestines with gauze in struggling patients.

The effect of gentleness in operating is shown by the following.

TABLE III

DEATH RATE FROM SHOCK FOLLOWING GYNECOLOGIC LAPAROTOMIES

	Per Cent
1215 laparotomies of operator X, a vigorous operator.....	0.75
First 900 laparotomies of operator W, a gentle operator, same average time and general conditions as for operator X.....	0.11
Last 400 laparotomies of operator W, all rules observed, average time thirty-five minutes..	0.00
Last 1100 laparotomies of Service, all operators, all rules observed.....	0.09

3. The elimination of the preoperative purge, the maintenance of a normal level of nutrition and of water in the body before

and after operation, the improved attitude of patients toward operation, and the conservation of warmth, have all contributed to the reduction of morbidity from shock.

#### HEMORRHAGE

It is a commentary on the thoroughness of all the operators whose work is involved in this study that only 1 death has occurred from postoperative hemorrhage, and that in a patient operated upon by an interne. Only 1 other patient is known to have had internal hemorrhage of a degree requiring treatment, following laparotomy.

#### CARDIAC FAILURE, UREMIA, INFECTIONS OF THE RESPIRATORY TRACT, DIABETES, HYPERTHYROIDISM, ETC.

These "medical" conditions are best avoided as postoperative complications by a thorough examination of the patient before operating; by consultation with appropriate specialists in doubtful cases; and by the judicious employment of laboratory and roentgen-ray aids to diagnosis and estimation of functional capacities. Neglect of these things is a very widespread fault; and a death from any of these conditions should call for a serious investigation of the case by the hospital staff. Errors of judgment will of course occur; and for this there is no remedy except such as lies in the continuous effort on the part of the operator to improve his knowledge, and his powers of observation and reasoning. It will be found that many cases, apparently inoperable on account of medical disease, may be converted into fair risks by proper preliminary treatment; and the medical condition much benefited by the removal of neoplasms, foci of infection, etc.

We have found spinal novocaine anesthesia an invaluable aid when operation must be done in cases with cardiac decompensation, acute or chronic infection of the respiratory tract, hepatic necroses, or advanced renal lesions. Its efficacy may be judged by the fact that no deaths occurred in the series of well over 200 laparotomies in which it was employed on the

ground that the cases were bad (often exceedingly bad) risks under inhalation anesthesia.

#### THROMBOSIS AND EMBOLISM

Thrombosis is less apt to occur if operation is postponed until after the subsidence of the active stage of pelvic infection; and, apparently, if the venous circulation is kept active by gentle exercises in bed; tensing the muscles, turning from side to side, etc. When thrombosis is established, it is probably better to maintain the part at rest, in order to lessen the danger of detaching emboli. In the case of enormous distention of veins (as in cases of fibromyoma uteri) ligation should be done well above the distended portion of the veins; in the rare instance of greatly dilated uterine veins, ligation of the hypogastric (internal iliac) veins may prevent an occasional death.

#### ADYNAMIC ILEUS

Our rule in regard to postoperative ileus which presents any serious difficulty of diagnosis between the adynamic and mechanical varieties, is to explore the abdomen promptly under spinal novocaine anesthesia. Very often after the spinal anesthesia is fully established the necessity for opening the abdomen disappears: large quantities of flatus and fluid are expelled, the distention subsides, and the absence of mechanical ileus is made evident. The apparent explanation for this is as follows: our method of giving spinal anesthesia produces a complete splanchnic block (the abdomen is never opened until anesthesia is complete to the sixth dorsal level); this blocking of the sympathetic nerves (which inhibit peristalsis) leaves the parasympathetics (which stimulate peristalsis) unopposed, and hyperperistalsis ensues, to last until the anesthesia wears off.

Adynamic ileus has virtually disappeared from the morbidity (except in the trifling form of gas pains without distention) since the discontinuance of

the preoperative purge and of rough handling and gauze packing of the intestines. Most fatal adynamic ileus will be found at autopsy to be due to diffuse peritonitis; but 2 deaths occurred from this cause in our series in which cases no peritonitis could be found at autopsy. In 1 of these cases the ileus had existed for several days prior to operation, in a patient with cerebellar tumor in whom the operation was done to check serious and intractable metrorrhagia from fibromyoma. This case would have received radium treatment if radium had been available at the time.

#### MECHANICAL ILEUS

All known fatal cases of intestinal obstruction following gynecologic laparotomy are included in this study, no matter how long after the operation the obstruction may have occurred, unless the obstruction could be shown to be due to some cause not connected with the previous operation or pelvic lesion. The majority of the 13 fatal cases occurred in patients who had left the hospital after an operative recovery and returned in advanced stages of obstruction. In such cases the mortality has been greatly reduced by the employment of jejunostomy or ileostomy under local anesthesia, followed by any necessary reparative work under spinal anesthesia after the subsidence of toxemia. Of 7 cases so treated, adjudged by all of us to be beyond any reasonable hope, 6 survived. The major operation in these cases is done under spinal anesthesia in order to prevent the superadding of a new adynamic ileus to inhalation anesthesia. The supply of an excess of sodium chloride seems to be a valuable adjuvant treatment.

#### ACUTE GASTRECTASIS

The best preventive of death from acute dilatation of the stomach lies in its early recognition and the prompt institution of curative measures. We do not consider that the routine use of gastric lavage immediately after operation is of much

service as a prophylactic. Lavage twelve and twenty-four hours after operation has seemed more effective. When the shock is marked strychnine and adrenalin or pituitrin should be given and hypodermoclysis started before passing the tube, and the contents of the stomach allowed to escape in small quantities with a rest between each. Two deaths occurred in cases in which this principle was not observed.

#### URETERAL OCCLUSION

This should virtually never appear as a cause of death and should be one of the rarest of accidents. It has occurred in the work of only 1 operator in this series. Immediate catheterization of the ureters in every case of postoperative anuria will clear the diagnosis, and measures to drain the urine should be taken before serious kidney damage has had time to occur. The condition constitutes a real emergency, and treatment must be undertaken at once. In neglected cases pyelotomy under spinal or local anesthesia is probably the best immediate treatment, relief of the occlusion or implantation of the ureters being done later when the patient is in better local and general condition.

#### MORBIDITY

No attempt has been made to tabulate statistics in regard to morbidity: the improvement was self-evident after the adoption of the principles of this paper. Peritonitis, shock, and adynamic ileus, except in the mildest forms, have virtually disappeared, the only serious exceptions occurring after violation of the principles. Superficial wound infection has been our greatest problem, but conditions in this respect have been very much improved with the abandonment of violent prolonged retraction; efforts to protect the wound from soiling have had very little demonstrable effect.

As regards the general well-being of the patient, the elimination of the ancient treatment-schedules which required "doing

something for" the patient every half hour or less, has been the greatest factor. The writer is convinced that he has seen patients die of sheer exhaustion from this cause who might otherwise have survived their shock or peritonitis or other morbid condition. The comparative status of patients operated upon under spinal anesthesia and under inhalation anesthesia is so noticeably in favor of the former that ward patients who have had opportunity to make comparisons invariably ask for the "needle in the back." This, with the infinite superiority of spinal anesthesia as regards mechanical conditions at operation, has almost persuaded us to adopt spinal as the routine anesthetic. We are deterred solely by the fact that no idea of its comparative safety can be obtained from individual experience, and, so far, the collated statistics are not conclusive. There have been no deaths in our series, and the only alarming symptoms have occurred when the rule of waiting for splanchnic block before opening the abdomen was disregarded.

The noticeably smooth convalescence of patients receiving large doses of morphine after injury to the intestine has led us to use morphine more freely and in larger doses than formerly. This is still under observation and no definite statement can as yet be made.

Attempts to feed the patient by mouth before peristalsis is normal, is a failure, and gives rise to much distention and toxemia. If sufficient food has been stored up prior to operation, none will be needed until a practically normal status as regards peristalsis has been regained; if this is delayed food may be supplied by intravenous or intrarectal injections of glucose solution.

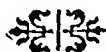
Our whole system of postoperative treatment hinges on 2 essentials: rest, with which no non-essential is allowed to interfere; and an adequate supply of water by rectum, by mouth, and, if necessary, by hypodermoclysis. If these 2 principles are conscientiously effected the patient's resistive and recuperative powers are kept at a maximum.

## CONCLUSIONS

The death rate after gynecologic laparotomies should not exceed 1.0 per cent or 1.5 per cent in any considerable series of cases, and should be less in series of private cases. In the last 1100 laparotomies of this series, in which the attempt was made to enforce the principles stated in this paper,

the gross mortality for all operators was 1.8 per cent. For the laparotomies in which the principles were actually observed the mortality was 0.82 per cent.

Much unnecessary suffering and lasting injury after operation can be prevented by the observance of the simple principles enunciated in this paper.



It is interesting to note that birth-omens, which have been specially studied by Dennefeld and Jastrow, led to the pseudo-sciences of physiognomy and palmistry. They also stimulated the study of fetal and adult abnormalities, for all possible phases of parturition and abnormalities of the fetus were regarded as signs and tokens of the individual's future fate, as being the attendant phenomena of a new life issuing from another. . . .

Chloroform in obstetrics and labor was first employed by Sir James Young Simpson (1811-70) of Bathgate, Scotland, Professor of Obstetrics at Edinburgh in 1840. He also introduced the use of iron wire sutures (1858), the long obstetric forceps, acupuncture (1850-64), the uterine sound (1843), the sponge tent, dilatation of the cervix uteri in diagnosis, "Simpson's pains" in uterine cancer (1863), and version in deformed pelvis.

# SUBMUCOUS FIBROIDS AND THEIR TREATMENT\*

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## THE FIBROID QUESTION IN THE PAST

NEARLY all students of the fibroid question agree that one cannot properly compare the fibroid literature of the past with that of the present time. In the earlier days of surgery, the operative mortality was so great that most surgeons limited their operative work to growths that could be removed through the vagina. Even long after the technique of abdominal hysterectomy had been standardized, the laity quite properly considered major surgery only as a last resort which should not be undertaken before they had tried all other methods which presented even the faintest hope of relief. By the time that a patient with fibroids was prepared mentally to undergo an operation for the actual removal of the tumor, she usually had been treated by all drugs that were believed to have oxytoxic properties, may have had "electrical treatments," usually had had numerous intrauterine medications and curettages, may have had a ligation of one or both of the uterine vessels made through the vagina, possibly had had attempts at vaginal morcellation, and rarely had had ligation of the ovarian vessels or ovariectomy after a much dreaded laparotomy. Consequently the tumors were either large or had long since given rise to symptoms of grave character by the time the patient finally came, driven by her condition, to the surgeon for a hysterectomy.

Therefore, it was to be expected that a considerable number of these patients would have complications of various types, dense adhesions, etc., in addition to the

degenerations and infections which might attend the tumor itself. Carcinoma and sarcoma were frequently seen; there were 62 attendant malignancies in a series of 1068 cases operated upon mostly during the late nineties by Noble, Cullingsworth, Scharlieb, Frederick and McDonald, as was cited by Webster in 1907. Many patients had cardiovascular conditions which may have arisen secondary to the anemia or possibly because of some toxic process which attended the extensive degenerations of the tumor. The mortality following operation was high, postoperative infection was so common as to be the rule, and in case thrombosis and embolism were not sufficiently extensive to cause death, they did cause very considerable morbidity. Prior to the nineties, laparotomy carried a mortality at times exceeding 25 per cent. When a surgeon was able to do hysterectomies for fibroids with only 10 per cent mortality, he was likely to become enthusiastic about its possibilities and urge, like Gordon, its application for the treatment of all early tumors. Yet the mortality fell slowly, as is shown in Table 1:

## THE FIBROID QUESTION AT THE PRESENT TIME

Nearly all surgeons realize that this great reduction in primary operative mortality is not due entirely to improvement in operative technique and to the better methods of giving anesthesia. No small part is due to the fact that women now come early to operation and in consequence the large complicated fibroids seen by the older generations of surgeons are an almost

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TABLE I  
GRADUAL REDUCTION IN MORTALITY FOLLOWING SURGICAL TREATMENT OF FIBROIDS

Date	Operator	Fibroids	Per Cent
1904	Winter	451 cases of Hofmeier, von Rosthorn, Martin, Olshausen, Schanta, Zweifel	
		Supravaginal hysterectomies	4.5
		Abdominal myomectomies	9.8
1903	Hunner	100 abdominal myomectomies	5.
1907	Kelly	691 abdominal hysterectomies	3.1
		306 abdominal myomectomies	4.5
1909	Kelly and Cullen, inclusive also for previous reports of Hunner and Kelly	901 abdominal hysterectomies	5.5
		296 abdominal myomectomies	5.4
1910	Mayo	900 supravaginal hysterectomies	2.5
		1244 myomectomies	2.3
1916	Deaver	750 cases; various surgical methods	1.7
1917	Mayo	504 consecutive myomectomies	0.8
1918	Broun	1500 fibroids; various surgical methods	1.8
1918	Surgical Staff, Woman's Hospital, New York City	262 fibroids, various surgical methods during 1918	1.5
1926	Mayo (Masson)	1643 abdominal hysterectomies	1.88
		259 abdominal myomectomies (five years inclusive)	.77
1927	Lynch	430 fibroids; various surgical methods during past ten years	1.4

unheard-of rarity, possibly because so many tumors are removed very early in their development and consequently do not have a chance to attain huge proportions.

Yet even at present the fibroid question is not as simple as may be assumed in spite of the fact that the conscientious surgeon does not operate for small growths that are not growing rapidly or causing symptoms. Nearly every surgeon yearly sees a number of women whose condition is distressing because of symptoms from fibroids, and if one carefully investigates such cases he is likely to find that a very large number of them are patients with submucous tumors.

This is as we should expect. If large tumors are now relatively infrequent, we should not expect to encounter frequently either serious degeneration or cases with dense adhesions resulting from the tumor's growth. This would reduce the figures, giving the older incidence of pain and toxicity in the symptomatology of fibroids, and make bleeding and pressure the more common findings.

However, there are comparatively few types of degeneration which occur in

fibroids and cause profound symptoms. In all instances except sarcoma, they result from some profound disturbance of the tumor's blood supply. Almost invariably present following marked torsion of the pedicle, they are also found in intramural tumors which are growing more rapidly than the uterine musculature which invests them and serves as the host. Thrombosis, venous stasis and hemorrhage are responsible for histologic changes. The ultimate result may be actual necrosis; yet this condition was found in only 4.7 per cent of Noble's 2274 collected tumors. Sometimes necrosis is antedated by red degeneration and necrobiosis. Hyaline degeneration does not cause symptoms nor do myxomatous changes unless of great extent or unless there is secondary infection. Edema antedates nearly all the degenerations but must be extremely marked to cause symptoms. Yet, as has been stated, at the present time a very large percentage of fibroids causing symptoms are submucous tumors.

#### ORIGIN OF SUBMUCOUS FIBROIDS

Submucous fibroids develop either (a) from small nodules arising in the uterine



musculature in close proximity to the uterine cavity; or (b) from larger tumors which originally were situated more deeply in the central zone of the uterine musculature (interstitial fibroids), but which grew in a centripetal direction into the uterine cavity. They are found more frequently near the fundus.

A fibroid of the type described in Group (a) grows in the line of least resistance and gradually bulges into the uterine cavity and forms a sessile tumor. It excites the uterus to greater effort to expel it at this stage than when it was a typical interstitial tumor, and may cause dysmenorrhea. The endometrium overlying the mass hypertrophies at the sides but thins at the top or may be broken through when the growth exerts pressure on the opposite walls of the uterine cavity. Pressure atrophy follows in the endometrium at each such point of firm contact. An attenuated layer of uterine muscle forms part of the capsule. The periods are usually prolonged and may be profuse. Intermenstrual bleeding is not uncommon. The tumor is gradually forced from its bed by uterine contractions and acquires a pedicle. At times of menstruation the tumor enlarges from edema and stimulates the uterine musculature contractions to increased activity.

The uterine polypoid fibroids originally are round, but may be molded by pressure in the uterine cavity into oval form. The resistance of the cervix also may alter their form, since the tumor is usually softer and more vascular than are the interstitial or subperitoneal types. The polyps soon lose their attenuated covering, which becomes eroded from pressure. More than one pedunculated submucous tumor in the uterine cavity is unusual, although when one has been expelled into the vagina or has been removed by operative procedure, another may gradually develop. The fact that the polypoid fibroids may present at the internal os during menstruation and recede later, become gangrenous and necrotic, and occasionally lead to inversion of the uterus, is well known to all gynecologic

surgeons. Very infrequently the polypoid mass is expelled into the vagina, sloughs from the pedicle and is thrown out from the body through the vagina. While this appears as the ultimate pathologic process if the case remains untreated, the patient may become so weakened from hemorrhage and infection as to succumb before it has resulted. Pedunculated submucous fibroids rarely undergo cystic or calcareous degenerations. Infection, however, is common.

All submucous tumors do not develop from the smaller nodules described in Group (a). Larger fibroids situated fairly deep in the uterine wall may move toward the cavity as they grow, encroach upon and finally be forced into it to form typical submucous tumors of fairly large size. They tend to deform greatly the uterine cavity and may disturb menstruation considerably although occasionally they cause no symptoms. Pregnancy may greatly accelerate the conversion of many larger interstitial fibroids into submucous tumors. The sudden evacuation of a considerably enlarged uterine cavity demands an immediate rearrangement of muscle layers, and the involution of the hypertrophied uterine musculature further disturbs the bed of the tumor. Involution after pregnancy may also convert subperitoneal fibroids into pedunculated structures. Infection of the uterus may favor the complete expulsion of submucous tumors.

#### FREQUENCY

Textbooks usually state that only 10 per cent to 15 per cent of all fibroids are submucous tumors. This is quite true if one counts all the nodules, of which there may be a great number on a fibromyomatous uterus. Sampson counted 1108 tumors in 100 carefully sectioned uteri; and in only 4 uteri was there a single tumor. Bland found 677 nodules in 188 fibromyomatous uteri; 310 of them were subserous, 256 interstitial, 42 submucous, 7 intraligamentary, and 2 parasitic. If we classify the cases accordingly as the major tumor is

submucous, intramural, subserous etc., the percentage of submucous growths will be much higher. In Sampson's fibroid series which he studied after injecting the arterial and venous circulation, there were 79 uteri removed primarily for fibroids. The submucous tumors were the principal condition in 16, while three others also had adenomyoma. More than one submucous fibroid was found in 5 of the 19 uteri with submucous tumors. In a recent study of my own material, I limited my survey with few exceptions to specimens which formed a mass at least equal to a three months' pregnancy. The idea in so doing was to avoid the necessity of attempting to evaluate the proportion of symptoms that were due to associated pelvic conditions usually found with the smaller tumors. The few exceptions noted above were uteri fairly riddled with a multitude of smaller tumors which so completely altered the organ as to make it the equivalent of a larger tumor. In 289 fibromyomatous uteri as above defined the submucous tumors were the major condition in 66, intramural in 152, and subperitoneal in 71.

#### HEMORRHAGE

Especially am I interested in hemorrhage as a symptom not only of submucous growths but of fibroids in general. Text-books usually mention hemorrhage first in the list of fibroid symptoms, from which the student is likely to conclude that if hemorrhage is not a complaint when the case is first seen, it will present shortly after. There is no doubt about the importance of hemorrhage in fibroid patients, but I believe that the frequency of the symptom is much overstated. Uterine bleeding (menorrhagia, metrorrhagia) was a symptom in only 37.5 per cent of 572 patients with fibroids in my service at the University of California Hospital, many of whom also had adnexal complications. Hemorrhage was not limited to patients with submucous tumors, since these growths accounted for but 60 per cent of the women

who gave bleeding as a symptom. Hemorrhage was a symptom in 83 per cent of all the patients with submucous tumors. Hemorrhage failed as a symptom in several patients who had large submucous tumors or those which encroached upon the uterine cavity but did not project far enough into it to warrant description as submucous growths. Many patients who had small submucous tumors had had much bleeding.

The hemorrhage was often severe enough to cause marked anemia. Ten of the 66 submucous fibroid patients in the larger tumor series had hemoglobin of 29 per cent (Dare) or less when they first sought treatment. The anemia in nearly half of the submucous fibroid patients in the larger tumor group required blood transfusions before their blood count rose to 3,500,000 red blood cells and 50 per cent (Dare) hemoglobin which we seek as a prerequisite for operation. Repeated transfusions were often necessary since the injection of blood often stimulated those with submucous polyps to renewed bleeding.

The cause of the hemorrhage is a matter concerning which there is much speculation. When there are deep-lying intramural fibroids or submucous growths, there is marked enlargement of the venous plexuses of the uterine musculature adjacent to the uterine cavity. These structures communicate with the venous capillaries of the endometrium by means of venules which pass through relatively anemic muscle tissue. There are no valves in the veins which lie within the uterus, so it is evident that a backflow may result if there is further venous engorgement such as normally happens at the time of menstruation. In order for the blood to escape, Sampson's work indicates that there must be physiologic or pathologic impairment of the venous capillaries of the endometrium. The former condition occurs during menstruation; the latter is a result of some pathologic process which causes a slough extending down into the endometrium. The resulting blood comes from the venous capillaries unless rupture

of the larger vessels has occurred, when there also may be arterial bleeding. The contractions of the uterine tissue aid greatly in maintaining a balanced venous uterine circulation. A backflow may be checked somewhat by contraction of the thin layer of uterine musculature which lies between the venous plexuses of the endometrium and myometrium. This layer, however, is likely to be lacking in uteri which contain submucous fibroids. The presence of the tumors also impairs uterine contractions and contributes to their inefficiency.

From Sampson's study of injected fibromyomatous uteri it would appear that the increased menstrual blood comes mainly from the hypertrophied and congested endometrium that lies adjacent to and is not encroached upon by the tumor, and that metrorrhagia in some cases is due to a rupture of veins which overlie the tumor itself. Histology supports this view since the endometrium is thinned and appears lifeless upon the surface of the tumors that jut far out in the uterine cavity. Their glands are attenuated or absent, and their circulation is scanty. On the contrary, the endometrium at the edges of the tumor and immediately adjacent is hypertrophied and rich in blood vessels and glands. Vessels are occasionally seen surmounting the dome of the tumor, usually covered by attenuated or atrophic endometrium. Sampson believes that injury to these vessels results in metrorrhagia, which does not otherwise occur unless the capillaries of the endometrium have been opened up by some pathologic process.

#### SYMPTOMS OTHER THAN BLEEDING

The symptomatology of submucous fibroids also includes pain, pressure and presence of the tumor. Pain other than dysmenorrhea is unusual, although the latter is a common complaint with small submucous tumors. In the larger tumors it may denote extensive degenerations or infections; and was present for these

reasons in 4 of 66 submucous growths, the tumor and uterus of which constituted a mass at least equal in size to a three months' pregnancy in utero. Pressure symptoms are more rare, but may occur when the tumor mass exerts pressure on pelvic nerves. Very rarely indeed is the complaint limited to the pressure of the tumor. Of the 66 cases noted above, 3 women gave pressure as their chief symptom, while 2 others complained only of the presence of a large-sized tumor.

#### STERILITY

The subject of sterility in fibroids must be approached with caution since the literature is not presented usually in such a manner as to enable a student to make proper deductions. Sterility was present in 33.6 per cent of 247 of my patients who had tumors at least the size of a three months' pregnant uterus, and who had been married for more than two years. Of these, 64 had adnexal disease, and in this series 42 per cent were sterile. Sterility was present in 28 per cent of 183 women in the same general group in whom operation disclosed large tumors without adnexal complications. There were 13 women (or approximately 20 per cent) sterile in 63 patients with large submucous fibroids who had been married a minimum of two years. This series, although too small to permit definite statements as to fibroids and sterility, in general tends to support the view that submucous tumors often develop in fertile women and that the involution of the uterus may be a factor in moving interstitial fibroids into the submucous position. That it is not a constant rule is evidenced by the fact that there were seven virgins in our series who had large-sized submucous fibroids.

#### BLOOD TRANSFUSION

Patients with submucous fibroids are very apt to seek medical advice only after they have lost much blood because of repeated or long-continued uterine bleeding. If the anemia is marked, the patient's

general condition should be built up before attempting treatment either by surgery or radium, unless the mass presents as a polyp at the external os and can be cut away without the necessity of obtaining exposure by incisions. Even then a blood transfusion decreases the risk of subsequent infection. Blood transfusions are too often considered a last resort and are not given until the patient is in a distinctly bad condition. On the contrary, they should be given early as a sensible precaution to avert the chance of even remote complications. Blood transfusion is without danger, if the grouping is proper and the bloods are without hemolysis and agglutination after careful checking and cross checking, *only* when it is given properly at rates of speed which are described in the technique of every article on transfusion. The laboratory test of cross checking should be made immediately before the transfusion because bloods which agree in the tests of a few days before not infrequently show slight disagreement at time of transfusion.

Transfused blood appears to me chiefly as the most assimilable of all foods, and as a means of giving the patient hemoglobin which can be worked over in her tissues and result in new blood formation. The stimulation of the hematopoietic centers by the transfusion may be minimal if there is marked anemia, since these centers may already be working at their very highest level of blood production. There is no evidence that transfused blood survives for more than a few days in the patient's circulation. Consequently I do not see that there are great advantages of whole blood over citrated blood except in cases with evidences of infection, provided that they are given with the same low percentage of systemic reaction. This is possible when the citrated blood is given slowly; not more rapidly than ten minutes for each 100 c.c. of the transfusion. Giving the blood early is more important than is the question as to whether it is whole or citrated.

Transfused blood occasionally stimu-

lates the patient with submucous fibroid polyps to a great increase in the amount of bleeding. Sometimes the blood loss is so great that the patient appears to derive but slight gain from transfusion. Injection of 20 c.c. or 30 c.c. of whole blood into the buttocks should precede the second transfusion. Time and much patience is often spent before such subjects can be put in shape for operation.

Modern diet is most useful in improving the patient's general condition. There is no doubt that a diet of liver, kidneys and spinach does more to build up the patient's blood and color than nearly any amount of iron injections.

#### TREATMENT

The treatment of submucous tumors varies with the size and position of the growth, the character and result of the symptoms, and the age and physical condition of the patient. Three methods are available for treating the tumor: surgery, the modern roentgen ray, and radium, each of which has definite advantages and disadvantages.

#### THE ROENTGEN RAY AND RADIUM

These have some similarity in their action in controlling bleeding and causing shrinkage of the tumor. The roentgen ray acts chiefly upon the follicles of the ovary, the destruction of which precipitates the menopause. A slight stimulation of the ovaries with the rays may cause an increase of bleeding. Some advocates of the roentgen ray claim that it has a direct action on the tumor and causes it to shrink, but as yet there is no proof that this can happen. The tumor shrinks in size as a result of a menopausal action. There is no evidence that it ever completely disappears. Recent literature indicates that the modern roentgen ray controls the hemorrhage in approximately 90 per cent of cases and causes at least some reduction in size of the growth in at least 75 per cent of patients. It indicates that the failures are in a good condition for surgery. The

roentgen-ray therapy has a distinct field in the treatment of large submucous fibroids, since by this means we usually can cure the symptom of bleeding. Yet all cases do not remain cured: bleeding may return after a lapse of months or many years, and the tumor may again start growing. I recently saw this happen in a case which I had considered a cure of eleven years' standing. There was no evidence of malignancy.

Yet the method is invaluable for treating large submucous growths without evidence of serious degeneration in patients whose blood count cannot be brought up to the margin of safety for operation, because they bleed out at once almost the complete amount of the blood transfusions. The roentgen-ray treatment is invaluable for controlling hemorrhage from large submucous fibroids in patients who have definite contraindications to operation, such as myocarditis, renal diseases, serious diabetes, marked obesity, etc. Otherwise the treatment should be restricted to women of approximate menopausal age.

The shortcoming of the method is chiefly that it fails to remove the tumor which may later redevelop and demand surgical treatment; and that its good results in controlling symptoms may be slow developing while distressing menopausal phenomena are more likely to begin promptly after treatment. The method is inelastic and permits of no deviation from the standard. Occasionally, moreover, normal doses of the rays merely excite the tumor to increased growth in spite of the fact that treatment has killed ovarian function. Each year I operate upon a number of such patients. Conservative work in them is valueless; the ovaries are dead. Many advocates of the treatment insist that the menopause is inevitable in women and one precipitated by treatment is a minor consideration. I formerly held that opinion, but extensive follow-up work has impressed me with the importance of maintaining ovarian function in young women. A precipitate menopause

from any form of treatment is more difficult to bear than the normal one which comes on gradually. In my experience the type that follows roentgen rays and radium is quite as severe and persists for as many years as that which ever follows removal of the ovaries at operation. Treatment of menopausal symptoms by any type of ovarian medication is a notorious failure. Good results follow even ovarian transplantation only rarely. If treatment by the roentgen ray invariably depends upon the production of the artificial menopause, and at best only controls symptoms and these slowly, and leaves a tumor which may in later years require removal, there is definite doubt as to its value as a general method of treatment. Burns still occur, although they are unusual with modern machines of high voltage and proper screening. Gastrointestinal burns may result from large doses. The method is too heroic for any but large submucous tumors.

*Radium.* When this agent is introduced into the uterine cavity, it affects chiefly the tissues in contact with it and the ovary in less degree. For this reason, it would appear more logical at first sight than the roentgen ray if we agree that retention of the ovarian function is advisable. Practically, however, it is nearly impossible to treat even small submucous fibroids in menstruating women without affecting the ovary and obtaining a menopause with vasomotor reactions. Moreover the advantage of shrinking the growth by placing the radium in contact with it is often more theoretical than real since it may be impossible to place the short radium capsule in a most advantageous position when the tumor lies in a cavity of five or six inches. It is not invariably easy to diagnose submucous tumors prior to removal. Personally I have had many failures in thus treating cases in which excessive hemorrhage was found at subsequent operation to be due to a submucous tumor not larger than 4 or 5 cm. in diameter, in cases that prior to operation were

considered intramural tumors. In contrast to roentgen ray, radium cannot be used for treatment if there is old pelvic inflammation. There is every chance that it will light up such a focus of infection.

The limitations of the treatment are real and demand complete recognition. Practically the treatment should be limited to small submucous nodules of women at the menopausal age who have no evidence of adnexal inflammation and in whom hemorrhage is the cardinal symptom. The results of such treatment have been most satisfactory except for the precipitation of menopausal reactions. There are as yet no reported instances of return of such tumors after radiation.

#### SURGERY

Even though surgery is essentially destructive, it affords an opportunity for elasticity in treatment and permits of conservatism. It causes pain and a period of semi-invalidism, a definite but small mortality and may entail other sequelae. It is costly in money. Yet it affords a chance for inspecting the environs of the tumor and thus gives the opportunity for reducing the chance of such grave complications as malignancy. By its means one may treat small tumors with proper conservatism or large growths with defensive radicalism.

A number of different surgical procedures are useful for treating patients with submucous fibroids. It by no means follows that in event surgical measures are indicated, this invariably means a hysterectomy. Comparatively minor surgical measures may result in cure and should be attempted if the patient is young, and has only small submucous fibroids. Such tumors, either pedunculated or sessile, frequently may be removed by the curette or curette forceps. Tumors up to 7 or 8 cm. in diameter may be removed if exposure can be obtained by cervical incision or vaginal hysterectomy. The tumor mass may be reduced by morcellation when exposure is difficult, but this technique is rarely necessary. Submucous and interstitial fibroids of

5 and 6 lb. have been safely removed in the past by Emmett and others, by the use of vaginal morcellation. While not good treatment at the present time because of its difficulty and the better results more often obtained by hysterectomy, the fact remains that in skilled hands it is a method which should be considered in very exceptional cases. The vaginal route offers many possibilities for treatment in properly selected cases. Exposure may not be difficult because so many women with submucous fibroids have borne children.

The methods cited above usually control symptoms and invariably offer a chance for conservation of the uterus and adnexa. They are not used as much as they should be because of the fear of uncontrollable hemorrhage. Yet excessive bleeding does not occur; the uterus contracts *pari passu* with the removal of the tumor, a point emphasized long years ago by Emmett.

Yet the surgeon should bear in mind that partial inversion of the uterus may occur with submucous fibroids 6 or 7 cm. in diameter, and that possible traction on a large sessile tumor may pull down with it the partially paralyzed section of the uterus which has served as the base of the tumor. By shelling out the tumor, the surgeon will avoid the possibility of opening up large uterine sinuses, or the more remote chance of an incision that extends through the wall and into the peritoneal cavity.

Vaginal hysterectomy is a method which should be considered when the vagina is capacious and the fibroid mass is not too large and can be pulled down sufficiently far to obtain good exposure. Vaginal hysterectomy has many points which commend it. Its relative safety, and the fact that the patient has infinitely less pain in convalescence, command our attention.

Conservation of the uterus is bad judgment even in young women when the vaginal route is impracticable and the patient has a uterus fairly filled with tumors. Abdominal hysterectomy is the method of choice in such cases. Yet I am impressed

with the many patients we see in whom the submucous tumor is the only fibroid worthy of attention. Abdominal myomectomy is not a reasonable procedure for the treatment of such patients because of the great chance of peritoneal infection. Abdominal myomectomy for interstitial growths to me is the method of choice whenever possible in treating young women. Yet it is one thing to remove a fibroid only a small part of which juts into the uterine cavity, and quite another to split completely the uterus and drag forth through a clean wound a tumor which is most likely to be infected if it has been giving symptoms.

There has long waged a controversy concerning the relative advantages and disadvantages of supravaginal and panhysterectomies. The former is easier, quicker and safer in the majority of cases. The objections are that carcinoma may develop subsequently in the cervix. Many authors urge that this occurs only in its normal incidence, that the removal of the uterus does not increase the individual's chance of having a cervical carcinoma, and that the cervix may be cauterized if eroded and left in perfect condition. They urge with right that more women will die because of the added risk of panhysterectomy than would develop cancer after the easier supravaginal hysterectomy if panhysterectomy becomes general. While in sympathy with these views, I perform panhysterectomy whenever practical if the cervix is diseased and a hysterectomy is necessary because of our individual results in treatment. My mortality is less following panhysterectomy than with the supravaginal method, because we reserve for the latter all the difficult cases. Occasionally I have found it necessary to resect the cervical stump at a subsequent operation, but

invariably insist that the patient returns for subsequent examinations at definite intervals. The cancer question will be solved only when "health examinations" become general and accepted.

Conservation of the ovaries is a weightier question in my mind than the treatment of the cervix. They should not be removed unless they are badly diseased, or unless the woman is past the menopause. Even if the tubes are diseased, the ovaries should remain unless they carry risk of immediate infection or give evidence of profound degeneration. Transplantation in the abdominal wall of small cubes of ovarian tissue is usually possible unless the ovaries show signs of serious degeneration.

There are many who urge the importance of removing the uterus so as to preserve the collateral branches between the uterine and the ovarian vessels, and avoid the chance of subsequent cystic ovarian degeneration because of the disturbance of the circulation. I must confess that after many trials I cannot see how this is possible. The uterine ovarian collaterals in fibroids demanding hysterectomy are several inches in length. They must be compressed after operation to one very much shorter. These vessels give off many arcuate uterine vessels which will bleed and require ligation. This in itself indicates a future thrombosis of the collateral circulation. The cystic changes that result in the ovaries indicate atresia of follicles rather than a new growth formation. There is no evidence that a conserved ovary maintains other than its internal secretion after uterine ablation.

In general, therefore, our plan of treatment of submucous uterine fibroids is governed by practical conservatism, aiming to maintain whenever possible all organs concerned in normal functions.





# RELATIONSHIP OF IMPERFECT DRAINAGE TO GENITAL CANCER IN THE FEMALE

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IN an article previously published<sup>1</sup> the writer advanced the theory that many gynecological cancers, especially those of the uterine body, are the result of imperfect drainage caused by stenoses, atresias and scars of the genital tract. The purpose of this paper is further to emphasize this theory, which continued experience tends to confirm. It is designed as a preliminary statement to the report of a much longer series of cases now in preparation but which could not be completed in time for this publication.

The subject of acquired genital stenosis and atresia is one that has received scant attention in gynecological literature. This is due doubtless to the fact that the lesions for the most part give few symptoms and cause only slight special pathology until years after their first appearance, so that when inflammatory or malignant changes do make their appearance the stenotic condition is too often regarded as the *result* rather than the *cause* of the disease.

We have for many years recognized the importance of partial and complete atresias in pelvic disease following the menopause, and have noted the frequency with which they occur in association with the atrophic cancers of old age. But it was not until the revelations of modern scientific research on the irritation theory of cancer causation that we became convinced that the obstructed drainage from genital stenosis plays an important part in producing the irritative factors that lead to malignant change. This theory, if it contains any truth at all, leads to far-reaching precepts in the routine treatment of gynecological cases from the standpoint of rational cancer prophylaxis.

The idea that obstructed drainage and

stagnation of secretions may produce in the secretions a chemical change sufficiently irritating in the course of time to stimulate cells to malignant growth is not a new one. Montrose Burrows has shown the influence of stagnation in the artificial growth of cancer cells *in vitro*, and is responsible for the often quoted dictum that "unicellular organisms grow best in stagnant pools and not in running water." There are numerous analogies in certain extragenital cancers that flourish best in poorly drained localities, such as intestinal cancers that occur most frequently at the points of angulation of the gut, cancers of the gall bladder, breast, skin, etc., where excretory ducts are obstructed.

A discussion of the exact process by which ill-drained or obstructed secretions induce the tissue cells to take on an independent growth is a matter of speculation. The solution of this question is not, however, important for our immediate practical purposes if it can be shown that imperfect drainage of secreting surfaces is an actual etiological factor in cancer production.

It may be said in general that the disturbances that gynatresic conditions produce in the genital canal are due to interference with function. The function of the genital outlet is threefold. It serves as an organ of copulation, as a canal for the birth of the child, and as a duct for drainage of the genital secretions. The gross mechanical obstructions, congenital or acquired, that hinder cohabitation or childbirth do not come within the scope of this paper. We are interested chiefly in those contractions which, without causing particularly definite symptoms, retard the genital drainage over long periods of time, and produce, after the menopause and in

<sup>1</sup> *J. Obst. & Gynec. Brit. Empire*, July, 1927.

old age, irritative tissue changes some of which lead eventually to cancer.

There is a prevalent notion that after the climax the organs of the female generative system are dead and functionless. Hence stenoses and atresias are too often regarded as of little or no importance. There is even an operation called "colpocleisis" sometimes employed for proclidentia by which the vagina is purposely obliterated. It is true enough that the organs after the climax are functionless

together with the accompanying diagrams have already been published in the article already mentioned, and are given in lieu of the longer series now in preparation.

CASE 1. Miss M., aged sixty-two years. Had never menstruated. Seen first in May, 1917. Diagnosis: spherical fibroid of the uterus. Operation, supravaginal hysterectomy. Cervix found completely obliterated. Pathological examination revealed large hydrometra with numerous papillomata growing from the endometrium. Diagnosis: adenocarcinoma. Patient

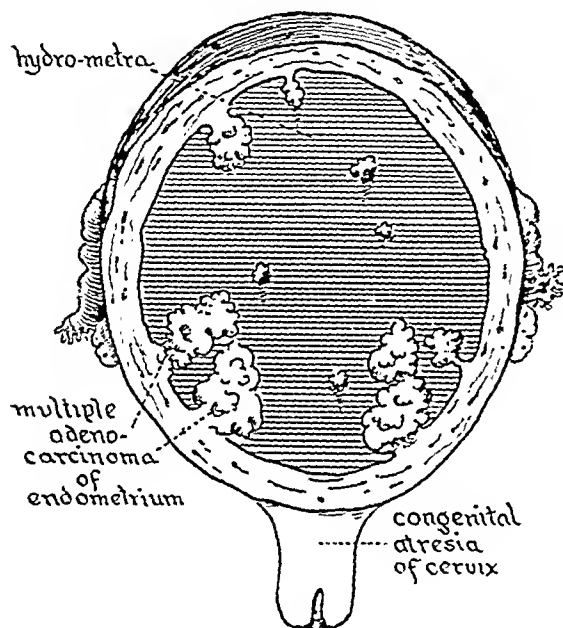


FIG. 1.

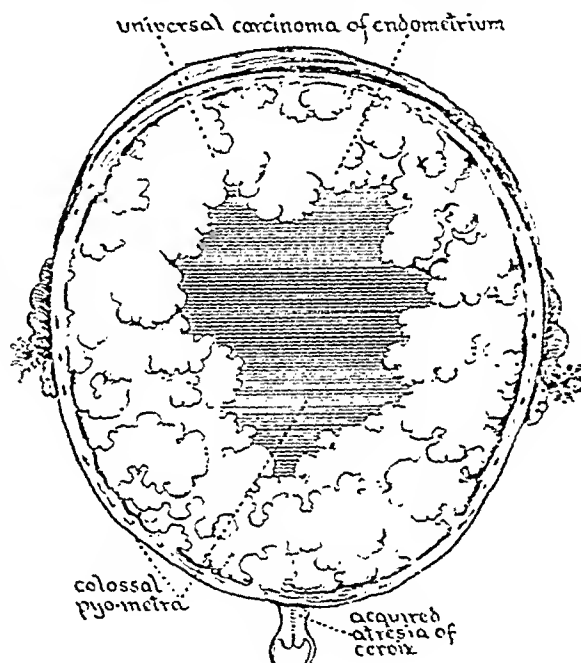


FIG. 2.

so far as menstruation, childbirth and, to some extent, copulation are concerned, but the lining cells of the canal are not dead; they are living, and no living cell can be said to be completely functionless. The mucosa of the uterus, cervix and vagina continue to have an important secretory function, diminished though it may be, and any limitation of this function results in such conditions as pruritus, vaginitis, leucorrhea, vaginal discomfort, and, we shall attempt to show, malignant disease.

In order to illustrate the probability that obstructed drainage may be an etiological factor in genital cancer, 5 typical cases are herewith presented. These cases

not seen after discharge from hospital; died within a year after operation from probable general carcinosis of the abdominal cavity.

CASE II. Mrs. F., aged sixty-six years. Four children. Menstrual life and menopause normal. Seen first October 13, 1924. Diagnosis: ovarian cyst. Operation, November 12, 1924, Dr. E. B. Sheehan. Hysterectomy with coring out of the cervix for enormous cystic uterus. Pathological examination revealed obliterated cervix, pyometra with walls lined with fungating necrotic growth. Diagnosis: adenocarcinoma. Patient now living and well.

CASE III. Mrs. A. A., aged forty-five years. Married twenty-three years. No pregnancies. First seen in July, 1907. History of

childhood vaginal atresia, lanced at age of puberty. Since then constant foul discharge. Coition incomplete. Pruritus vulvae. Examination showed marked kraurosis with gluing of labia; atresia of vagina, middle and lower third with pin-hole opening. Operation July, 1907. Complete exsection of obstructing vaginal membrane. Uterine curettings negative. Operation April, 1909. Complete vulvectomy for kraurosis. Operation 1912, by Dr. Henry T. Hutchins, panhysterectomy for early adenocarcinoma of fundus. Patient still living.

cervical canal was obstructed by a cervical polyp. The posterior lip of the cervix and the upper vagina were the seat of a squamous-cell carcinoma which invaded both parametria and pararectum. Treatment by radium. Death one year later.

Obstructing scars, bridges, dams, general stenoses and atresias of the genital canal may be acquired in numerous ways. For the sake of clearness they may be classified from the standpoint of causation, as: (1)

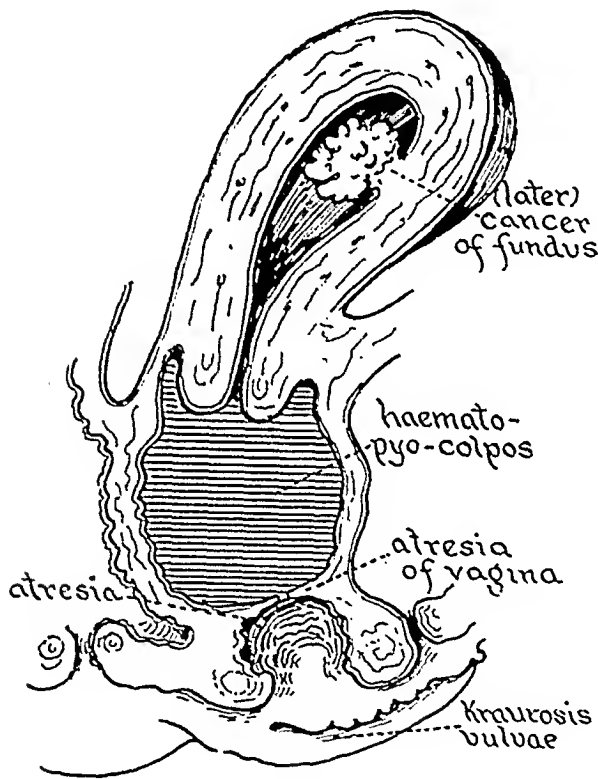


FIG. 3.

CASE IV. Mrs. E. M. G., aged forty-seven years. Seven children, 3 abortions. Seen first in October, 1916. Diagnosis: general prolapse. Operation, general reconstruction including repair of cervix, and plastics on the relaxed vagina. Seen again in October, 1921. Atresia of the upper vagina and cervix. Specimen from cervix showed early adenocarcinoma. Patient did not return for treatment. Death about one year later.

CASE V. Miss C. C., aged fifty-five years. Never married. First seen in June, 1923. History of blood-stained, watery discharge for four weeks. Examination showed marked genital atrophy. The vaginal outlet was obstructed by a tight, cicatricial hymen. The

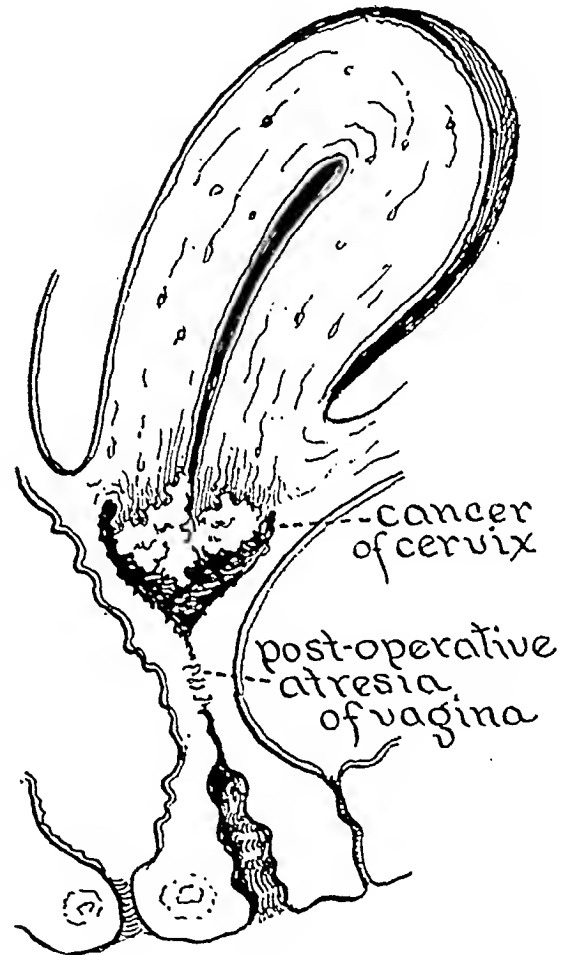


FIG. 4.

inflammatory, (2) obstetrical, (3) post-operative, and (4) atrophic, although, as will be seen, more than one factor is usually responsible in the later chronic stages.

*Inflammatory.* Gynatresia from acute inflammatory processes most commonly takes place in girls before the age of puberty. It is the result of pyogenic infections in which childhood gonorrhea plays an important part; or it may occur

as an end-result of a vaginitis complicating an exanthematous disease. Such gynatresias represent a plastic gluing together of the hymen or the vaginal wall just behind the hymen. They become evident at the onset of menstruation. That a childhood gynatresia may conceivably lead to cancer late in life is illustrated by Cases I and III. Occasionally an acute inflammation of the cervix following childbirth may induce a complete atresia of the cervical canal.

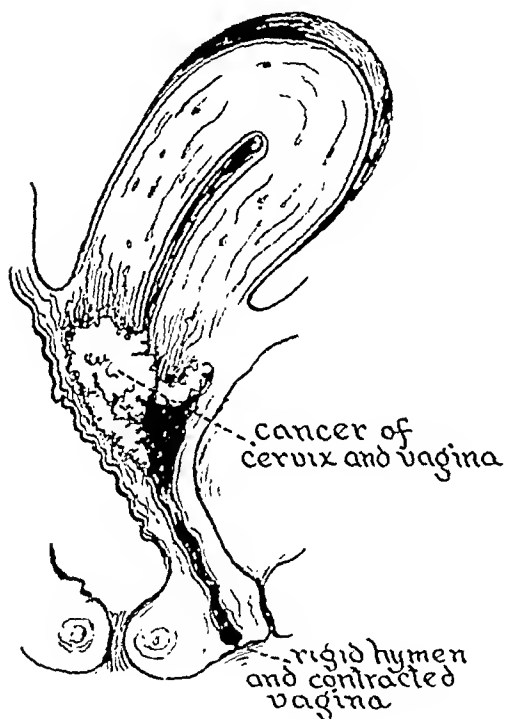


FIG. 5.

Chronic inflammatory processes are to a greater or less extent found in association with the atrophic contractures of the post-climacterium.

**Obstetrical.** Deep contracting scars of the cervix, upper vagina, and sometimes of the perineum resulting from childbed injuries, may produce strictures that permanently impair the vaginal drainage. Scarring and immobilization of the cervix has long been recognized as an etiological factor in cervical cancer. This influence is probably due partially to obstruction of

drainage, since it is largely responsible for the ectropion, ulceration, hypertrophy and infection of the endocervical mucous membrane, factors that contribute in an important measure to the long-continued cell irritation that ultimately leads to malignant disease.

**Postoperative.** Genital contractures following injudicious, unskillful plastic operations on the cervix and vaginal canal are extremely common. They do not become evident for the most part until the atrophic changes of the post-climacterium and old age take place. This subject will be further discussed in the latter part of the paper. An example of postoperative atresia and cancer is given in Case IV.

**Atrophy.** The majority of cancers that may be said to owe their etiology to impaired drainage occur during the epoch of genital atrophy dating from a premature or normal menopause, or from one that has been artificially induced by a surgical operation. Strictures may be the result of simple atrophy in organs in which there have been no previous lesions, and may be represented by partial or complete closure of the cervical canal, extreme narrowing of the vaginal lumen, or rigid contraction of the hymen. Impaired drainage with chemical changes in the retained secretions encourages infection and plastic vaginitis which in turn increase the general obstructive process. Scars from obstetric lesions, ulcerations, inflammations and overzealous surgery, that were innocent before the climax, become, under the influence of atrophy, dense, shortened, unyielding, and a menace to the patient's health. In most of the cases in the writer's series the cancer process occurred *above* and not *at the site* of the obstructing lesion, and in fact the great majority of them were cancers of the uterine body. This may be accounted for by the fact that the majority of the lesions involved the cervical canal. That a cancer of an uninjured cervix may follow obstruction in the lower vagina and hymen is shown by Case V. These cases strongly suggest that

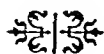
undrained or poorly drained secretions have sufficient irritative power to induce cancerous changes in the living cell tissue that encloses them. One may see an analogy to this process in the malignant degeneration of the serous cystadenomata and endometrial cysts of the ovary which offer excellent examples of the possible cancer-producing influence of pent-up secretions.

It must frankly be admitted that these conclusions may be criticized as being of a *post hoc* nature. It might be said that the concurrence of the cancer and the stricture is a pure coincidence. Or it may be objected that the cancer is due to a local atrophic starvation of the cell, the atrophic process producing at the same time a non-malignant stricture in the tissues below the cancer. New and strikingly confirmatory evidence, however, appears so frequently in the writer's practice that he is convinced that the stricture is in most cases primary and that it bears a causal relationship to the cancer growth.

*Treatment and Prophylaxis.* If the cancer menace is added to the other well-known evils of gynatresia a new responsibility is thrown upon the shoulders of the gynecologist. It involves in the first place a keener attention to the health of the pelvic organs in the post-climacterium and old age; and in this effort cooperation on the part of the patient should be secured by education of the public. Among the social classes the greatest danger of genital cancer is *after* the climax. Not only must every woman who exhibits the faintest sign of possible cancer be subjected to

immediate intrauterine examination and biopsy, but every woman who shows after the menopause obstructive lesions of the genital tract should receive such surgical treatment as will insure free and competent drainage. Any surgeon who pursues such a policy will be astonished at the number of early cancers that he will encounter, and at the frequency with which such cancers are associated with genital strictures.

We have already alluded to the frequency with which plastic operations are followed by obstructing scars that may later lead to pathologic complications. The avoidance of postoperative scarring is the very keynote to plastic surgery. A proper discussion of the subject would entail a complete review and valuation of the methods employed in genital reconstruction. Suffice it to say that the plastic operator should have continually in mind the changes in his handiwork that will later be made by atrophy. Above all, he must fashion the tissues in a way to ensure full permanent drainage. The cervical and perineal outlets should be funnel-shaped and distensible. The normal contour of the vaginal lumen should be preserved and the vaginal walls should be unconstricted, smooth and elastic. Evil results follow injudicious amputations of the cervix, asymmetrical tracheloplastic denudations, abnormal shortening or narrowing of the anterior vaginal wall, vast dissections and overzealous fascia building, neglect of the valuable suspension principle, high lateral denudations<sup>1</sup> at the perineal outlet, and careless, inexact approximation of wound edges.



# CARCINOMA OF THE UTERINE CERVIX

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CHICAGO

CARCINOMATA of the female generative organs are much more frequent than those of the male generative organs. This may best be shown by quoting the statistics taken from deaths from cancer in England and Wales between 1911 and 1920.

	Male	Female
Total deaths.....	175,871	224,503
COMPARISON OF DIFFERENT SEX ORGANS		
Organ	Male	Female
Ovaries.....		5,493
Testes.....	928	
Uterus.....		40,175
Prostate.....	5,077	
Vagina and vulva.....		2,807
Penis.....	1,749	
Urethra.....	28	51
Breast.....	302	39,930
Total.....	8,084	88,456

In other words, 10.93 times more deaths from genital cancers occurred in the female than in the male. The fact that cancers of the internal female sex organs are hidden and deep seated is probably one of the reasons for these appalling statistics. The gynecologic surgeon knows the efficacy of the surgical and roentgenological methods of treatment and the large number of five year cures obtained by these methods in the early stages of cancer disease. Therefore improved methods of early diagnosis are essential to bring about a decrease in deaths due to carcinoma of the female genital organs. More deaths occur from carcinoma of the uterus than from that of any other organ with the exception of the female breast.

## THE EARLY DIAGNOSIS OF CARCINOMA OF THE UTERUS

Every carcinoma begins as a solitary focus, a nodule. It never grows in healthy tissues or organs. It does not possess a limiting capsule as does a benign growth, but is infiltrating like the roots of a tree. A carcinoma probably arises from a subepithelial inflammation which stimulates the epithelial cells to proliferate. The chronic inflammation causes a decrease in the differentiation activity of the epithelial cells which then grow into the depth and become atypical.

The diagnosis of *the first or nodular stage* of carcinoma of the portio vaginalis cannot be made by inspection or palpation because nodules of a benign nature are seen more frequently than nodules of a malignant character. Harmless nodules are follicular erosions. If they are incised mucus exudes. Should the incision cause bleeding then a diagnostic excision must be made, for the nodule is probably malignant. The histological examination with the microscope alone can give us positive information.

The second stage of carcinoma is that of *ulceration*. The ulcers are usually deep, are excavated, have sharp edges and an indurated periphery. They must be differentiated from the benign erosion. If an ulcer on the vaginal portion of the cervix is touched with a cotton applicator and does not bleed it is probably benign; the cancer ulcer, however, bleeds and the blood is arterial. An immediate diagnostic excision must be made to rule out carcinoma.

These two initial stages do not cause specific symptoms unless irritated locally as by a gynecological examination or by coitus. A more or less profuse discharge

without color and without odor may be present.

The third stage of portio carcinoma shows friability or necrosis of tumor tissue. The early tendency to central necrosis or corrosion or friability is a characteristic sign of advanced carcinoma disease. It is always accompanied by a reddish brown or sanguineous discharge with a putrid odor and hemorrhages at irregular intervals usually occurring after a local irritation.

The differential diagnosis of portio cancers comprises erosions, tuberculous ulcers, luetic chancre, chancroid and sarcoma. The microscope will enable us to determine the nature of the lesion present.

The first sign of carcinoma of the cervical canal and the body of the uterus is irregular hemorrhages. These cancers are especially deceiving because the portio and external os may appear perfectly normal. If under strictest aseptic precautions a sound is introduced into the cervical canal and the uterine cavity, and a thin stream of bright red blood escapes into the vagina, then this observation may be regarded as highly suspicious of malignancy, especially if the trickling of blood continues for some time after the manipulation. These signs are only a contributory means of arriving at a diagnosis and should not be conclusive. Hence dilatation of the cervical canal, exploration with the probe, diagnostic curettage and microscopic examination must be done to render an immediate and correct diagnosis.

The differential diagnosis of corpus cancers should include myomata, pregnancy with threatened or incomplete abortion, adenomyomata, chronic hyperplasia of the endometrium, tuberculosis of the endometrium, chronic metritis, and so forth.

The early stages of carcinoma of the uterus, i.e., the nodular and ulcerative stages, are symptomless. As soon as friability and necrosis occur then hemorrhages appear. They are caused by any local irritation. Hemorrhages occurring during postclimacteric years usually mean

cancer. All bleeding at any period of life that does not occur synchronously with the physiologic menses must be viewed with grave suspicion until it has been proven to be benign. Every woman suffering from uterine hemorrhages should be examined and, if the cause does not become evident, the uterus should be curetted, suspicious looking nodules and ulcers should be excised and all the tissue examined microscopically. Such diagnostic curettage and excision of tissue should always be done immediately and without delay.

A white or yellowish discharge also requires a thorough investigation and immediate diagnosis to rule out cancer.

We may sum up as follows:

1. If a woman suffers from a vaginal discharge, especially blood-streaked, and menorrhagia or metrorrhagia, then an immediate and positive diagnosis should be made to rule out cancer.
2. Cancer age, number of pregnancies, pain and cachexia are not characteristic of the early stages of carcinoma.
3. Discharge and bleeding of early cancer of the uterus do not differ from similar symptoms observed in accidents of pregnancy, benign tumors, chronic inflammations, hemorrhagic metropathies, and so forth. Hence an immediate diagnosis must be made, corroborated by microscopic evidence.
4. If the physician postpones the diagnosis of carcinoma until pain and putrid discharges appear, then the cancer has progressed to a hopeless stage. A life has probably been sacrificed.

The diagnosis of carcinoma of the cervix would be incomplete without a determination of the extent of the growth. By physical, bimanual, and proctoscopic examinations the answers to the following five questions should be given:

1. Is the cancer clearly localized in the vaginal portion, the cervical canal or the uterine body?

The portio growth having the size of a navy bean is probably clearly localized. Normal mobility of the uterus would



mean localization in the cervical canal or uterine body.

2. Does doubt exist on the absolute localization? A doughy-like consistency of the paracervical tissues and a decrease of mobility mean beginning infiltration of the tissues adjacent to the uterus.

3. Are the parametria and the adjacent organs or the regional lymph nodes involved and are the invaded structures (a) movable or (b) fixed?

Such involvement can be revealed only by recto-abdominal palpation, cystoscopy and proctoscopy. Bullous edema of the posterior bladder wall means involvement of the vesicouterine or vesicovaginal septum. Thickening, infiltration and loss of mobility and elasticity of the anterior rectal wall and irregularity and edema of the rectal mucosa as seen through the proctoscope are indications of extension of the carcinoma into the rectal wall. The hypogastric and iliac lymph nodes can be palpated through the rectum just beneath the brim of the pelvis at the bifurcation of the common iliac artery. Such examinations can be performed only with the patient completely relaxed by an anesthetic.

4. Have metastases occurred in distant organs?

5. Do other grave diseases complicate the cancer; as coexistent tuberculosis, diabetes mellitus, cardiac and nephritic lesions, and so forth?

The answers to these five questions enable one to group the carcinomata clinically. The indicated method of treatment is based on these groups.

We have adopted four groups, namely:

1. *The clearly localized carcinoma.* The tumor is the size of a navy bean and the uterus has normal mobility.

2. *The borderline carcinoma.* There is a wide or peripheral invasion of the cervix or body of the uterus, a doughy consistency of the paracervical tissues, and a decreased mobility. A pull on a tenaculum forceps attached to the cervix does not result in a complete downward displacement. A uterus normally movable can be displaced down-

ward to the vaginal introitus without any resistance being offered.

3. *The inoperable carcinoma.* Infiltration of one or both parametria with or without regional lymph node involvement, with or without invasion of adjacent organs, with the structures, as a mass, still movable—these are contraindications to operability.

4. *The terminal carcinoma.* This tumor is characterized by fixation of tissue and wide local extent of the disease, "the frozen pelvis," and distant metastases.

The *complicated carcinoma* is one associated with general diseases that are considered poor surgical risks. It would transfer an otherwise Group 1 operable carcinoma to Group 2 for purposes of treatment.

The grouping of primary carcinomata enables one to determine the indicated method of treatment: Group 1 cases are always treated surgically; Group 2 cases are given radium and roentgen rays according to our combined method. Group 3 cases indicate radium and roentgen-ray therapy; and Group 4 cases should be treated palliatively. A cancer that is fixed always offers an unfavorable prognosis and therefore such a case should not be unnecessarily subjected to expensive and extensive treatment.

Before subjecting a patient with uterine cancer to operation we must always determine whether operation could be successfully performed. Operability depends upon

1. *Normal mobility.* Mobility is normal if the uterus can, with a tenaculum forceps applied to the cervix, be pulled down to the introitus vaginae without resistance. 2. *The cervical canal must be patent.* If it is not patent pyometra may exist. A sound inserted into the uterine cavity through the cervical canal gives evidence of presence or absence of pyometra. 3. *Afebrility of patient.* If fever is present the surgeon should wait fourteen days after temperature has subsided before operating. 4. *Absence of pathogenic bacteria.* If the latter are present, operation is contraindicated. The Phillips-Ruge test is probably

the simplest. Ten c.c. of blood taken from the patient's basilic vein are inoculated with the cervical discharge. If cultures grow within twenty-four hours pathogenic bacteria are present; if growth did not occur then operation may proceed without worry about a subsequent septic peritonitis. 5. Lastly, determine *the surgical risk* the patient offers. If all these five factors can be answered in the affirmative then operation is safe. If only one of the factors should be negative, operation is absolutely contraindicated.

The prognosis of treatment of carcinoma therefore depends on: 1. An early diagnosis; 2. A correct grouping of the cases according to the extent of the growth; 3. The application of the correct method of treatment. The five year end-results obtained in 183 cases of primary carcinoma of the uterine cervix treated from 1914 to 1920 inclusive with the combined radium and roentgen-ray method gave the following results:

Group.....	1	2	3	4	Total
Total number.....	10	21	93	59	183
Five year healings..	8	7	11	0	26
Per cent.....	80.0	33.3	11.8	0	14.2

If the inconclusive cases, namely 57, are subtracted from the 183 cases treated, then 126 cases were followed for five years with 26 five year healings, or 20.63 per cent. The cases of Group 4 characterized by fixation of the tumor, have all succumbed. They give an absolutely bad prognosis. On the other hand, it may follow that radiation therapy in uterine carcinomas gives results which compare well with those obtained from surgical methods. The inherent dangers of operation in uterine carcinomata can be practically eliminated by observing the contraindications to the operation as cited before.

Another question enters into the equation of prognosis of treatment, namely, the histological character of the carcinoma. Schottlaender and Kermauner, Lahm, Martzloff, Broders, Greenough and others

have investigated the histopathology of uterine carcinomata. Broders, Greenough and the writer have proved that high malignancy is shown by cells and nuclei of low differentiation, of irregular shape and size, without secretory function, arranged in solid columns, large or small, with hyperchromatism, and with numerous and irregular mitoses. On the other hand, a tumor

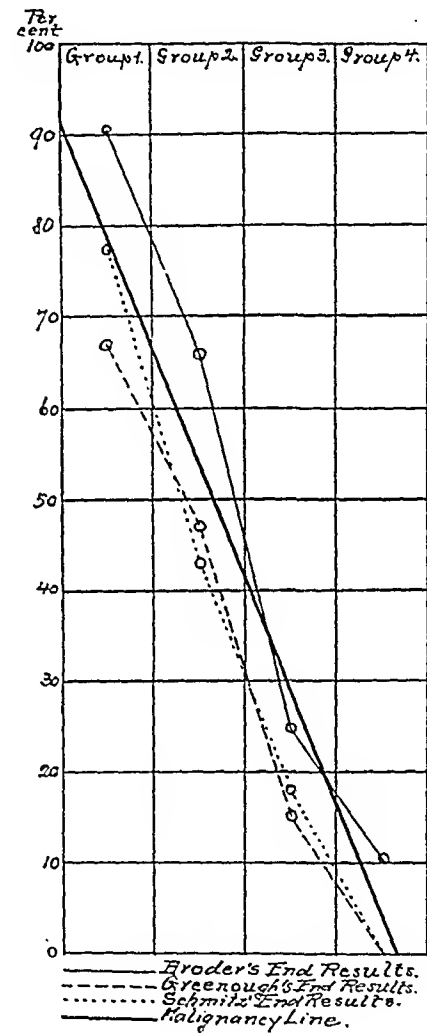


FIG. 1.

evincing a high differentiation with uniformly sized and shaped cells and nuclei, with few mitoses, with high secretory activity, with a high degree of cell differentiation, and with absence of hyperchromatism indicates low malignancy.

Broders divided his cases into four grades, Greenough into four classes, and the writer into four groups according to the index of malignancy found present. The following table shows the results:

## GREENOUGH'S RESULTS

Class	Pathology	Num- ber of Cases	Num- ber of Cures	Per Cent of Cures
1	Much differentiation.....	6	4	66.67
2	Moderate differentiation.....	19	9	47.27
3	Slight differentiation.....	43	10	23.26
4	Highly malignant.....	22	0	0

## BRODER'S RESULTS

Grade	Pathology	No. of Cases	Per Cent	Per Cent Good End- results
1	Differentiation 100 to 75 per cent	82	9.31	99.20
	Undifferentiation 0 to 25 per cent			
2	Differentiation 75 to 50 per cent	40	46.25	66.16
	Undifferentiation 25 to 50 per cent			
3	Differentiation 50 to 25 per cent	262	32.04	24.82
	Undifferentiation 50 to 75 per cent			
4	Differentiation 25 to 0 per cent	109	12.38	10.09
	Undifferentiation 75 to 100 per cent			

## SCHMITZ'S RESULTS

Group	Pathology	No. of Cases	No. of Good End- results	Per Cent Good End- results
1	Malignancy Index 10 to 20 Average 15.6	13	10	76.97
2	Malignancy Index 21 to 25 Average 23.17	14	6	42.86
3	Malignancy Index 26 to 30 Average 26.41	11	3	27.27
4	Malignancy Index 31 to 40 Average 33.33	4	0	0

These results may also be plotted as seen in Figure 1. The relative parallelism of the

three graphs certainly gives a sufficient proof of the prognostic value of the histological malignancy index. If the percentages of each group are added and divided by 3, then the number 78 is obtained in the first column and the number 3.38 in the last column. A straight line drawn through these points will cross the ordinates at values within which the good end-results of treatment are contained. In the future the clinician will probably have to consider the clinical extent of the disease and the histological malignancy index and exclude from treatment all cases of clinical Group 4 and the histopathological Group 4.

## CONCLUSIONS

1. The diagnosis of early carcinoma of the uterus and cervix can be made only with the microscope, as the symptoms and signs are too indefinite.
2. The determination of the clinical extent of the growth is of great importance, as the indications of treatment and prognosis of the disease are dependent thereon.
3. The study of the histopathology of a carcinoma furnishes evidence of great prognostic value if the results of the clinical and pathological studies are compared.
4. Continued study and application of the three facts enumerated above will finally bring the carcinoma patient to the physician at an early stage when probably 75 per cent of the patients may be permanently relieved from this dreadful disease.



# EPISIOTOMY AND THE IMMEDIATE POST-PARTUM REPAIR OF BOTH OLD AND NEW PERINEAL INJURIES\*

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THE care and repair of the perineum during and after labor has been the subject of many discourses and conflicting opinions, yet so rapid has been the progress in the technique of this important matter that the former custom of leaving unrepaired a patient torn by confinement is now a mere memory. Within a comparatively few passing years it has become of paramount importance that everyone including obstetrics in his practice should be able to perform an effective perineorrhaphy with proper surgical skill and finesse.

The purpose of this paper is to discuss episiotomy (perineotomy) with its indications and technique, as well as to endeavor to find a common ground for certain views on perineorrhaphy, which are now somewhat divergent. It is also my desire to recommend, as others have done before, that gynoplastic repair of certain long-standing injuries can be successfully accomplished at the time of delivery to the obvious economic and physical advantage of the patient.

## EPISIOTOMY

It is still a matter of open discussion whether or not episiotomy should be performed when a laceration seems inevitable; whether the procedure is ever required for multiparas or should be limited to primiparas; and when it is to be done whether the incision should be lateral or median.

It is axiomatic that clean-cut wounds heal more readily than those that are ragged-edged and contused. This would seem to dispose of any controversy as to the desirability of an episiotomy wound as compared to a birth laceration. The

repair of the former is much more simple, and failure of union occurs less frequently than in these edematous, torn tissues.

Episiotomy is desirable, therefore, if laceration appears to be inevitable, or at the first sign that it is beginning. Even before the fourchette begins to give way in front of the advancing head a spurt or trickle of blood is often seen, and this is an invariable indication of tearing of the vaginal mucosa. Episiotomy should be done at once when this occurs.

The median incision has been my preference because the resulting wound is more symmetrical, thus affording greater facility afterward for careful apposition of the separated muscles. Moreover, the muscles are merely separated because the incision follows anatomic lines of junction, being made directly backward in the fibers of the median raphe. The muscle bundles are not divided as in the lateral episiotomy. The results from the latter method are excellent in the hands of DeLee and Greenhill of Chicago, who are the foremost advocates of the lateral episiotomy, but repair of the mesially incised perineum is a simpler anatomic procedure for the majority of men.

If the incision is being extended by the advancing head to the point where the sphincter ani is exposed, these muscle fibers are also to be preserved by incising further, but now to one side or the other, so as partially to encircle the anus. The reason for making this lower portion of the wound in a lateral direction is again that anatomic lines are to be followed and division of the muscle bundles is to be avoided.

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The indications for episiotomy, therefore, are primarily to avoid inevitable lacerations; less frequently in instances of fetal distress manifested late in the second stage, episiotomy becomes a quick substitute for low forceps; and in multiparae who have been well repaired previously, episiotomy divides occasional dense bands of scar tissue which may so interfere with the advance of the head as to offer an obstacle to delivery and to cause undue delay late in the second stage.



FIG. 1. Median episiotomy (1); the sphincter to be encircled (2) in order to preserve muscle, if original incision is being further extended by advancing head.

Episiotomy is by no means to be confined to primiparae, because a woman whose perineum has been competently sutured at previous confinement is likely to be as much in need of incision as the average primipara.

The operation should not be made a routine procedure in primiparae but like any other well chosen operation should be done only for definite cause.

Certain authorities, notably Potter,<sup>1</sup> contend that perineal laceration is practically avoidable if the vaginal floor be "ironed out" in advance of delivery.

Some of this manual dilatation may be useful in many instances, and it is probable that actual breaks in the mucosa and skin may be almost entirely avoided by the maneuver. It does not, however, insure against wide separation of the levator muscles with marked rectocele subsequently, and in these instances it would have been better to have a wound through which the damage beneath could be repaired. I have attended two women who had been "ironed out" at previous confinements by one of the leading advocates of this procedure, both of whom showed bulging rectoceles.

The observation has likewise been made repeatedly that certain women who had no visible laceration of the mucosa or skin at the time of delivery later showed extensive pelvic floor damage and relaxation.

#### THE REPAIR OF FRESH PERINEAL WOUNDS

The general consensus of opinion is that perineorrhaphy should be performed immediately following the end of the second or of the third stage of labor unless some urgent contraindication exists to make this impossible. Hemorrhage and shock are practically the only two obstacles to such a repair because this work may be done under local anesthesia if there is any reason for avoiding a general anesthetic.

Some few years ago B. C. Hirst<sup>2</sup> of Philadelphia astonished the obstetrical and gynecological world by insisting that fresh lacerations should not be repaired until the tenth day of the puerperium in order to effect a more accurate apposition of the tissues and thus to accomplish more nearly the same plastic and functional results which follow a later "secondary" perineorrhaphy. He claimed for this so-called "intermediate" repair a smaller percentage of failures of union than in those patients sutured immediately following confinement; but this is probably offset by the women who flatly refuse on the tenth day to submit to such an operation and who, therefore, go entirely unrepaired.

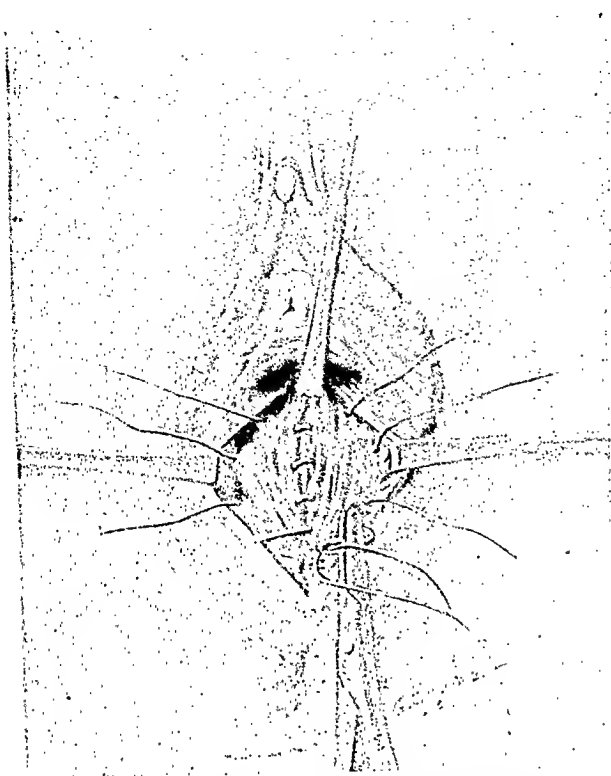


FIG. 2. Perineal repair. Lateral traction affords wide exposure of entire wound especially including upper angle. A clear field is necessary in order to place deep muscle sutures.

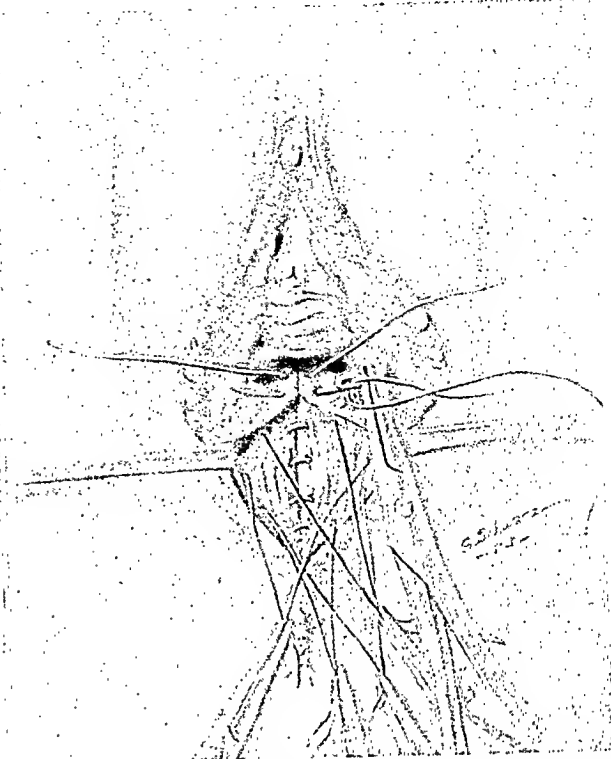


FIG. 3. Perineal repair. Superficial sutures are to be placed in mucosa while deep sutures are still held in clamps. To tie the buried sutures first narrows the field of operation so that the upper end of the wound is concealed from view and may be missed by the sutures.

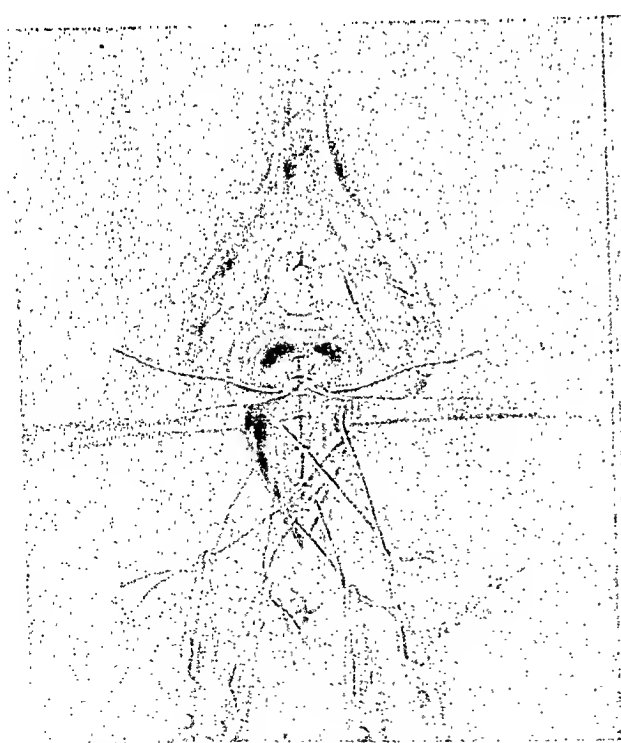


FIG. 4. Perineal repair. After tying superficial mucosal sutures the buried ones are to be united by a surgical knot. They are to be drawn snug, but not too tight, in order to avoid edema and cutting, and all dead spaces must be eliminated.

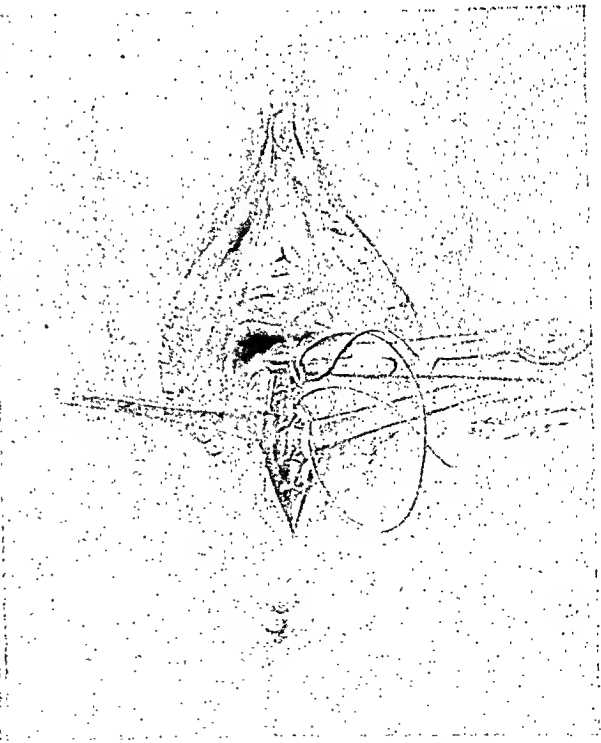


FIG. 5. Perineal repair. Wound in skin surface of perineum is to be closed by a subcuticular stitch, care being taken to avoid leaving dead spaces.

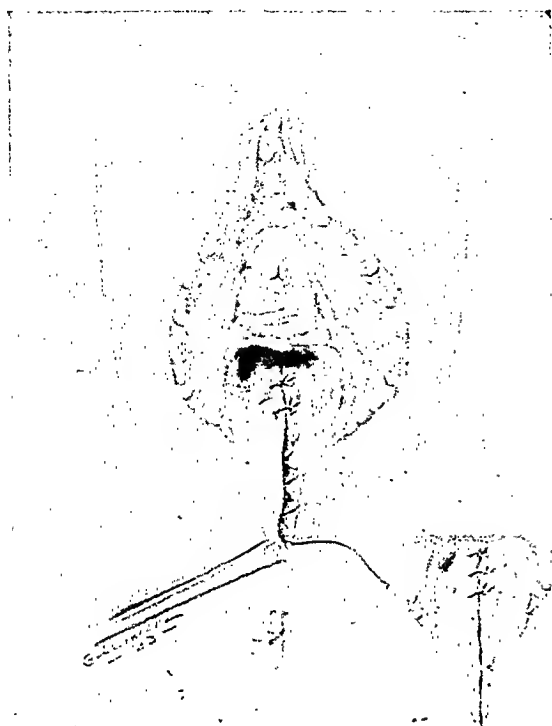


FIG. 6. Perineal repair. Final step in closure, and final appearance of perineotomy wound when repaired. Note that the subcuticular suture line is concealed from effects of lochial flow.

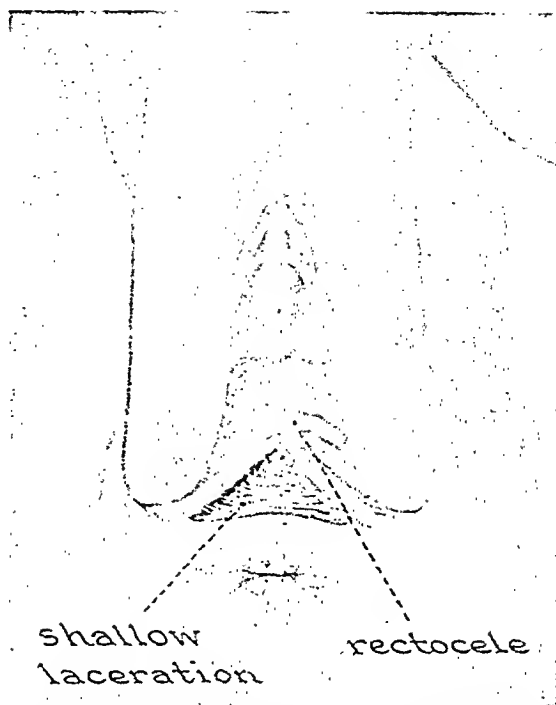


FIG. 7. Post-partum repair of old defects. Shallow abrasion or tear is frequently seen in multiparas even in presence of moderate or fair-sized rectoceles. Mucosa has been separated and muscle fibers with old scar tissue are visible beneath abrasion.

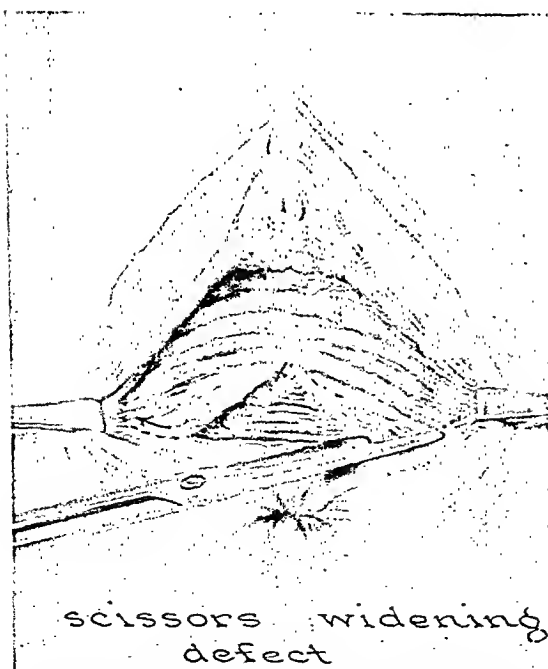


FIG. 8. Post-partum repair of old defects. Widening of laceration in order to expose bodies of levator muscles which have been separated since the previous confinement at which the pelvic floor injury occurred.

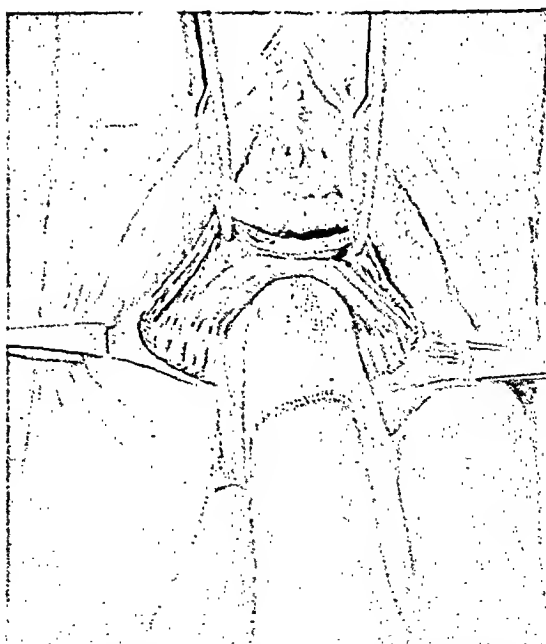


FIG. 9. Post-partum repair of old defects. Blunt dissection upward of mucosal flap in order to obtain higher exposure of muscle bodies.



His recommendations were of great value in calling attention to the need for more careful technique in the repair of recent lacerations, but in spite of this the opposite extreme is still seen even in current, authoritative textbooks. Here one gains the impression, from the dearth of detail as to how a perineorrhaphy should be done, that practically all that is necessary is to close over any rent in the vaginal floor, chiefly in order to prevent infection. Needless to say many practitioners accomplish little else when they "take stitches."

subcuticular stitch the catgut is not exposed to the lochial flow, and even though this line of suture should give way and the skin edges separate, as is sometimes inevitable, the muscles will hold if properly sutured, and give a final result which is functionally excellent.

#### GYNOPLASTIC REPAIR OF OLD DEFECTS IMMEDIATELY FOLLOWING CHILDBIRTH

Even in multiparae with considerable pelvic floor relaxation delivery frequently causes an abrasion or shallow tear at the

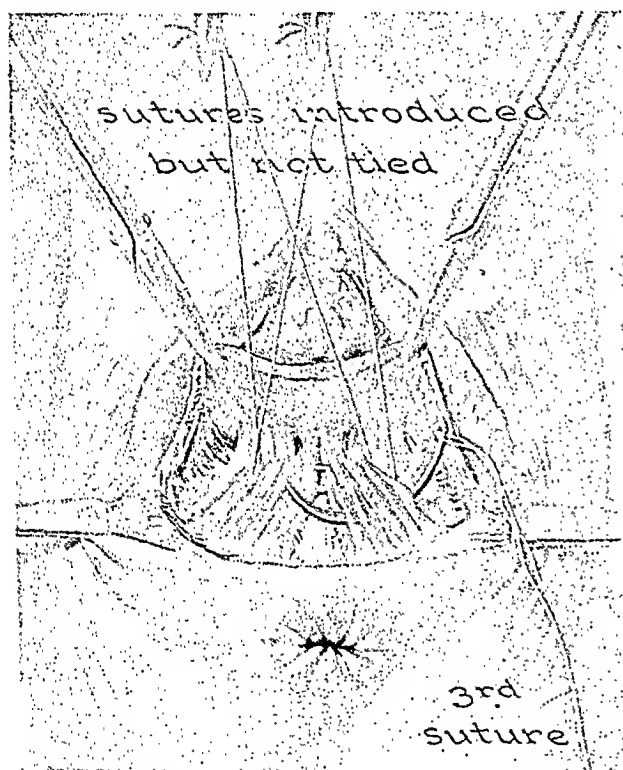


FIG. 10. Post-partum repair of old defects. Deep sutures placed as in primary perineorrhaphy.

Mere closure is not sufficient but the accompanying illustrations depict the various steps in such detail that no further attempt will be made to describe a primary perineorrhaphy. It is desired, however, to emphasize several essential points.

Proper exposure is necessary in order to have a view of the extreme upper angle of the wound; the bodies of the muscles must be brought together from this upper angle down through the mid-line of the entire perineal body in order to correct their separation; and dead spaces must not be left in closing the skin. By using a

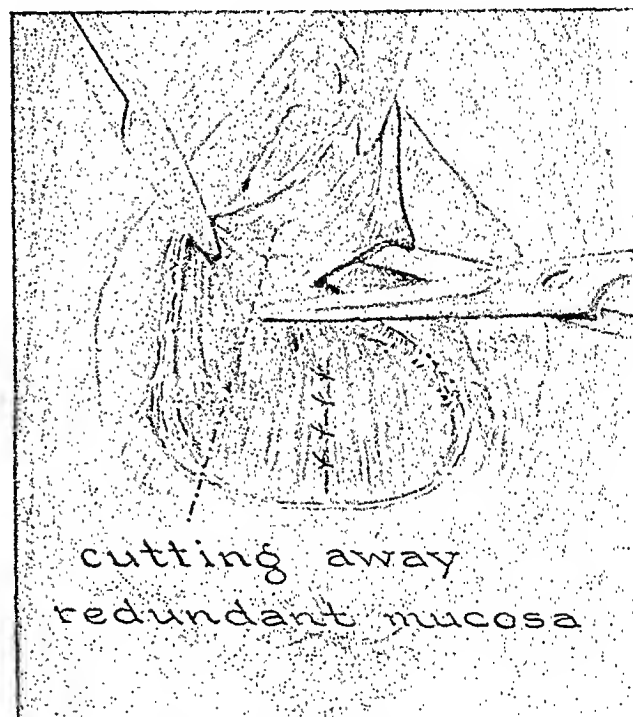


FIG. 11. Post-partum repair of old defects. Pelvic floor defect having been repaired by union of separated muscles, the redundant mucosa is trimmed away. Closure of vaginal mucosa and skin edges proceeds as in primary repair. (See Figs. 4, 5, and 6.)

mucocutaneous junction. One has the choice of neglecting this entirely or of suturing it merely on the principle of closing any superficial open wound. For many years it has been my custom to take advantage of this abrasion by deliberately enlarging the opening in order to attack the rectocele.

There is no particular fear of doing a fairly extensive primary perineorrhaphy immediately post partum if the wound exists, and there is no good reason for not widening this abrasion as illustrated in

Figure 8, dissecting the mucous membrane flap sufficiently to expose the muscles, uniting them in the usual way and closing the wound precisely as one is accustomed to do when a deep laceration or episiotomy wound makes this necessary.

The arguments of edema and distortion of the tissues from the traumatism of labor, as well as that of the risk of phlebitis from thus opening up possible avenues of infection, are always advanced when such a procedure is discussed or recommended. In a multipara with any degree of old perineal relaxation, edema of the vulva from the delivery is negligible, and serious infection rarely results from operative work at the vulval outlet.

All the patients in our obstetrical department are anesthetized for delivery (Gwathmey rectal analgesia and nitrous oxide with oxygen wherever possible, and invariably ether for delivery) so that there is ample opportunity for repair work. Indeed in these days to deliver patients without anesthesia smacks of ancient midwifery and is inexcusably brutal indifference for a doctor to display.

Such repair work is an economic advantage to the patient and results are surprisingly good. Primary union occurs as readily and as constantly as with the ordinary perineorrhaphy to which we are all accustomed. Occasionally I have deliberately incised and repaired an untorn rectocele but as a general rule prefer not to interfere unless a torn area already exists. Immediately post partum I do not attempt extensive repair work involving the bladder floor and I am entirely unwilling to invade the cervix except for definite reason such as fresh and bleeding lacerations. In the cervix after sufficient dilatation to pass a child's head such misleading distortion is always to be seen that it is useless to attempt more than the repair of fresh tears in the cervical lips; moreover there is considerable risk of infection of the uterine cavity from operative invasion of the cervical tissues at this time.

Several authorities have discussed the

suitability of operating during the puerperium for the cure of old lacerations of both cervix and perineum. Hussey<sup>3</sup> has reported a number of cases successfully repaired and quotes Francis H. Stuart as having made this suggestion in 1906. Hussey operated from one to fifteen days post partum; Brandess<sup>4</sup> performs secondary perineorrhaphies on the sixteenth to eighteenth day post partum; and Rudolphson<sup>5</sup> discusses such a procedure with favor.

My ideas are more conservative, however, and conform more nearly to those expressed by Bubis<sup>6</sup> who operates in the majority of his cases immediately after the expulsion of the placenta. It is true that a small minority of his reported operations were done sometime within the first week. Moreover, in his immediate repairs he does not limit himself to vaginal floor injuries, approaching with little or no hesitation the more extensive work necessary in instances of old cervical laceration or cystocele formation.

In this respect my contention is that any extensive work which may be necessary on the cervix or the bladder floor falls properly into the class for which a typical secondary operation is advisable, and would better be done at a later time. On the other hand, many old injuries of the rectocele type could be repaired at confinement but are now neglected solely because the injury is not a fresh one.

To do such plastic repairs at any other time during the early puerperium necessitates a second anesthetic with all the psychic disturbance which comes to the patient from a second trip to the operating room. This is especially unfavorable if she is nursing her newborn baby. As compared to the immediate repair which avoids not only this but also any prolongation of the patient's usual post-partum stay in the hospital, the delayed repair saves nothing more than a few days' time at the risk of partial failure. If any postponement is necessary it would seem advisable to wait until involution is com-

plete, then to carry out an ordinary secondary repair.

### CONCLUSIONS

1. Episiotomy when necessary affords a clean-edged, sharply cut wound which may be repaired more easily and heals more readily than the contused, ragged-edged wound of the ordinary birth laceration.

2. Episiotomy should be performed to avoid inevitable or beginning lacerations, but may also serve the purpose of hastening delivery if the delay is due to a rigid perineum or to scar tissue from previous repairs. It is likewise a useful substitute for low or outlet forceps application in instances of fetal distress late in second stage.

3. The median episiotomy, encircling the anus if necessary in order to preserve the sphincter, is preferable to the lateral episiotomy because the former follows the anatomic lines of muscle union, and does not divide muscle bundles.

4. Mere avoidance of breaks in vaginal mucosa or in skin does not insure against submucous muscle separation with subsequent rectocele formation. Manual dilatation of the vulva before delivery (the Potter "ironing") therefore is not a substitute for episiotomy or an invariable preventive of pelvic floor relaxation.

5. Fresh perineal wounds should be repaired immediately after delivery of the fetus and before delivery of the placenta unless the latter separates too soon to allow this.

6. Properly to repair a perineal laceration its extreme upper angle must be visible; buried interrupted sutures must

approximate and hold the levator muscles from this upper angle down through the entire perineal body to the skin surface; mucosa and skin are then united separately over the muscles.

The chief fault in the usual repair is that no effort is made to do more than merely close the wound, and pelvic floor relaxation inevitably follows if muscles have been divided and are not reunited.

7. Multiparae having old rectocele formation often show abrasion or shallow laceration after delivery. This may be widened, and the muscle bodies exposed by the blunt dissection upward of a flap of vaginal mucosa followed by closure in the usual way, thus actually repairing the rectocele under the same anesthetic by which the patient has been delivered.

8. More extensive gynoplastic work on the cervix or the bladder floor for chronic lesions is a dubious procedure at the time of delivery. Likewise, such operations during the early puerperium offer little advantage over a secondary repair at a later date after involution is complete.

9. The technical steps in episiotomy and perineorrhaphy are illustrated by drawings.

### BIBLIOGRAPHY

1. POTTER, I. W. Version. *Am. J. Obst. & Gynec.*, 1921, i, 560.
2. HIRST, B. C. Intermediate repair of injuries of the genital canal in childbirth. *Am. J. Obst.*, 1917, lxxvi, 50.
3. HUSSEY, A. A. Operating during the puerperium. *Am. J. Obst.*, 1916, lxxiii, 1014.
4. BRANDESS, T. Ist die sekundäre Dammnahrt empfehlenswert oder nicht? *Zentralbl. f. Gynäk.* (suppl.), 1926, I, 1459.
5. RUDOLPHSON, W. Ueber die Frage der Sekundärnahrt am Damm in Wochenbett. *Zentralbl. f. Gynäk.* (suppl. Feb 16), 1924, xlviii, 344.
6. BUBIS, J. L. Gyneplastic repairs following childbirth. *Am. J. Obst. & Gynec.*, 1925, x, 213.



# OVARIAN CYSTS COMPLICATING PREGNANCY

JENNINGS C. LITZENBERG, M.D., F.A.C.S.

MINNEAPOLIS

**I**N contradistinction to myomata of the uterus complicating pregnancy, which seldom require surgical operations, ovarian cysts discovered during gestation, labor or the puerperium with very few exceptions call for surgical interference at once. Succinctly stated: in the presence of fibroids one must know the exceptional case requiring operation; on the other hand when ovarian cysts are found, he must know the exceptional case not requiring operation or when not to operate.

I present the following cases to illustrate different phases of pregnancy accompanied by ovarian cysts:

**CASE I.** Mrs. H. Referred in the third month of gestation. There was a cystic mass about 10 cm. in diameter imprisoned in the pelvis behind the pregnant uterus, which was diagnosed as a right ovarian cyst (Fig. 1).

When an ovarian cyst is found in pregnancy, we almost always conclude that it should be removed as soon as possible. In this case it was manifestly impossible for the baby to be born. As the cyst was incarcerated in the pelvis operation was advised.

She was operated upon four days later and a right ovarian cyst removed. It was tightly imprisoned in the pelvis, firmly impacted, although it was not adherent. It was held down by the pregnant uterus and the promontory of the sacrum, and when finally released, was followed by a loud suction sound like pulling one's foot out of the mud.

The woman went through her pregnancy and labor without complication.

**CASE II.** Primipara, aged twenty-six. This case illustrates the very rapid growth which sometimes takes place and the tremendous size which may be attained by tumors of the ovary complicated by pregnancy.

When she first consulted me at the sixth month of her gestation, she was not unusually

large and I had no suspicion that there was an ovarian cyst. It is not at all uncommon for ovarian cysts of moderate size to be missed when they lie above the brim of the pelvis, hidden behind the uterus. Although she was instructed to report for examination every month, I heard no more from her until she came in labor three months later. Her abdomen was increased to the enormous size shown in the illustration (Fig. 2). This picture was taken after her delivery, but apparently the abdomen was just as large as before delivery.

When I was called, I found her in labor. On account of the size, of course, the evidence was in favor of an ovarian cyst rather than hydramnios or ascites, but I could hardly understand how she could grow to such an enormous size in the three months since I had seen her. I was prepared for a flood when her membranes ruptured, but she had only the normal amount of amniotic fluid. The baby was in normal position. There was no difficulty attending the delivery of the baby or placenta, and there was less bleeding than in the average case.

We operated upon her two months later, after she had fully recovered from her labor, and found a right ovarian cyst, containing 9 or 10 gallons of fluid. We recovered 6 gallons, and we estimated that at least half that much had been lost. The woman became very cyanotic during the operation but her postoperative recovery was without complications, although it took the enormously distended abdominal wall six months to return to normal.

This case answers the question of growth of ovarian cysts during gestation, both as to rapidity of increase and great size which may be reached. Unlike fibroids, ovarian cysts do not always increase in size, but this case shows the possible danger.

**CASE III.** Mrs. T., primipara, aged twenty-two years. She was first seen when she was four

months pregnant. She was not unusually large, and the presence of an ovarian cyst was not suspected until after her delivery. It was another of those cases, said to be so common, in which an ovarian cyst is unrecognized because it is behind the uterus (Fig. 3).

After delivery, an ovarian cyst of the right ovary, about the size of a newborn infant's head, was discovered to the right and behind the uterus (Fig. 4). Fortunately it had not

came on to Minneapolis. When I saw her, the symptoms had subsided. The cyst was now considerably larger than it had been at the previous examination, and she was told that an operation was imperative.

We operated and found a cyst filled with dark bloody fluid. The pedicle was twisted and the cyst wall was a very dark color and in some places necrosed. Her recovery was uneventful. She has since had two children.

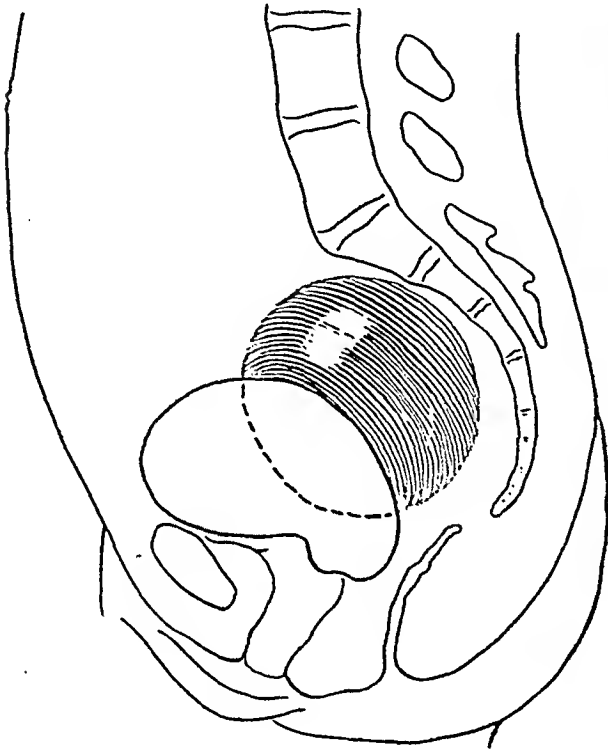


FIG. 1. CASE 1. Ovarian cyst incarcerated in the pelvis, behind a three and one-half months' pregnant uterus under the promontory of the sacrum. Cyst surgically removed. Patient went to full term and was normally delivered.

grown to the size of the tumor in the previous case, and had given the patient no trouble. Following the rule, however, that the discovery of an ovarian cyst calls for its removal, she was advised to undergo an operation.

Her home, before marriage, was in a distant city and she refused operation until she could go to her home and visit her parents; so against my advice she went to New York. On the train on her return, she began having pain, which from her description was undoubtedly the symptoms of the twisted pedicle of an ovarian cyst. The pain increased so that her husband contemplated taking her off the train at Milwaukee, but she was somewhat relieved when the train came to that point, and she



FIG. 2. CASE 11. Photograph of a woman taken soon after delivery, showing an extremely large ovarian cyst containing 9 or 10 gallons of fluid.

This case illustrates how failure to make a diagnosis can easily occur, but it lays emphasis more strongly on the dangers of a twisted pedicle and the necessity for operation as soon as possible.

CASE IV. Mrs. R. This is another case in which I did not make the diagnosis until after delivery. She passed through a normal pregnancy. Her labor was long and slow. The child was in an O.D.P. position and presentation. It took her twenty hours to dilate the cervix and then the head did not engage, and her pains failed. The membranes being unruptured, she was given a rest, with morphine and chloral. After six hours' rest she had strong labor pains, but four hours' effort failed to engage the head so the membranes were ruptured and an internal podalic version performed, resulting in a living baby. Her immediate recovery was uninterrupted.

I discovered a cystic mass in front of the

uterus. I operated upon her a few days later, removing a dermoid cyst, 10 cm. in diameter.

The cyst probably accounted for the failure of the head to engage. I have delivered her twice since, with normal short labors, so the cyst may have accounted for our trouble in the first labor. Fortunately ovarian cysts seldom rupture during labor, for if this dermoid cyst had spilled its irritating contents into the abdominal cavity, we might have lost our patient from peritonitis.

A cystic mass in the right upper quadrant was first noticed immediately after delivery. Because of the blood loss, which seemed to account for the evident symptoms of hemorrhage, and the subsequent improvement in the patient, we did not at first sufficiently consider the probability of a twisted pedicle or rupture of the cystic tumor as factors in the production of the shock which occurred after delivery. The fact that the tumor was estimated at not more than 10 cm. in diameter at the first

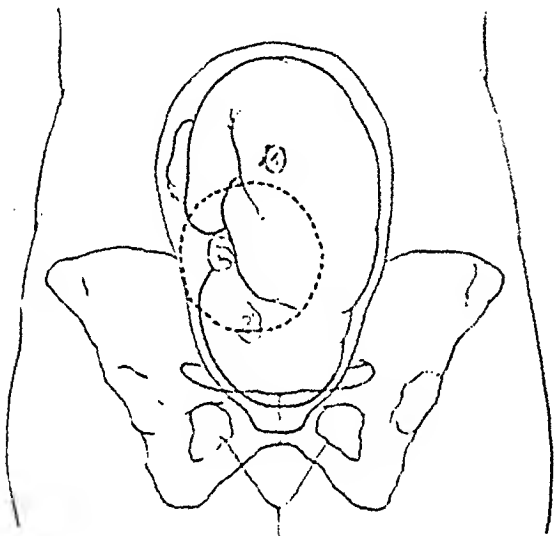


FIG. 3. CASE III. Pregnancy at term. Dotted lines show how an ovarian cyst may not be discovered on account of being hidden behind the pregnant uterus.

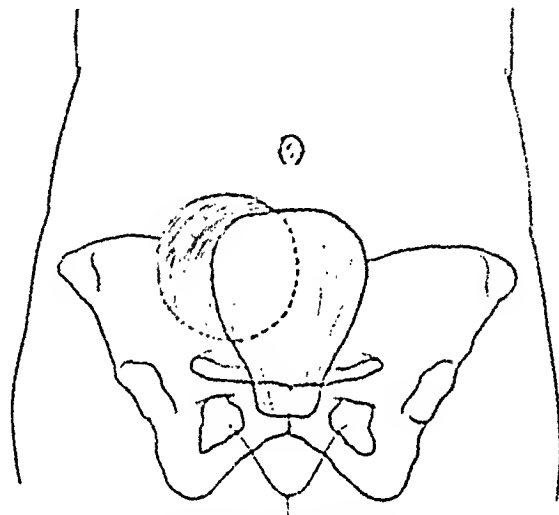


FIG. 4. CASE IV. Same cyst as in Fig. 3 to the right, found behind the uterus immediately after delivery.

CASE V. Mrs. H., aged twenty-one years. Admitted to the University Hospital, November 14, 1920, in labor. The abdomen was very large and the patient was obese and anemic. Her labor was slow and long, and was terminated with low forceps on November 15, 1920. On admission the pulse rate was 124 and during labor was as high as 160. The blood loss at delivery was estimated at 600 c.c. or 1000 c.c. but the patient's condition was fairly good. Two hours after delivery she began to feel weak and dizzy, was very restless, and complained of air hunger. Her pulse rate was 180 and blood pressure 80/20, respirations 24 per minute; she was evidently in severe shock, thought to be from blood loss. After hyperdermoclysis and administration of oxygen, her condition improved slowly and the next day, November 16, 1920, all symptoms were improved; her pulse was still rapid, but of good quality and the blood pressure was 114/80. Her condition gradually improved each day.

examination and was very soft and flabby would lend credence to the possibility of a rupture, but the later increase in size would discredit this theory. The mass was more tense on December 1, 1920, and about three times as large as it was when it was first discovered immediately after delivery. We thought that in all probability the mass was a right ovarian cyst; however, its location, so high in the right upper quadrant under the ribs in the kidney region, made us desire to exclude all other possibilities.

The steadily improving condition of our patient eliminated the necessity of immediate operation, so there was time for further study of the case. Cystoscopic examination, pyelograms, and gastrointestinal roentgenograms were made on December 4. Cystoscopy and pyelograms showed the tumor extending to the upper pole of the right kidney but not connected with it. Fluoroscopic examination of the abdomen showed a normal gastrointestinal tract. Plates revealed a vague shadow in the

upper right quadrant, probably a tumor, which was extragastric, but there was no clue to its origin. On December 8 the mass extended from beneath the costal margin nearly to the pubis and almost as much to the left as to the right of the midline. It was soft and fluctuating and could be moved on all sides except adjacent to the ribs. The hand could be insinuated between the tumor and the ribs; it seemed fixed above but not below. The widest transverse measurements taken around the contour of the cyst was 36 cm. and the measurement taken longitudinal to the body in the midline was 23.5 cm. The tumor seemed to be growing less tense. Inasmuch as no emergency seemed to exist and our patient was improving every day we decided to wait until she was in better condition for operation.

**Operation.** On December 17, 1920, the abdomen was opened and a right, pseudomucinous ovarian cyst was found pushed well up under the ribs, probably forced into this position by the enlarging pregnant uterus. After the cyst had been aspirated, the pedicle was found twisted one and one-half turns to the right. There was no large hemorrhage into the cyst.

**Pathological Report.** "Very large sac of an ovarian cyst with a thickened hemorrhagic wall and lined with a rough red surface. Cross sections of the wall show a large amount of blood. Microscope revealed considerable extravasated blood in the connective tissue wall."

The patient left the hospital in good condition on December 31, 1920.

This case illustrates the grave danger of a twisted pedicle, which is particularly apt to occur during the puerperium. Whether the collapse of the patient two hours after delivery was due entirely to the twisted pedicle is uncertain. Probably the post-partum hemorrhage which at first was thought to be the cause of the shock was also an important factor.

#### DISCUSSION

Ovarian cysts occur about once in 1500 pregnancies. Most of them are relatively small and in the pelvis but even the small ones may effectively block the pelvic canal. There seems to be quite a difference of opinion about the growth of ovarian cysts during pregnancy. Herbert R.

Spencer in his classical Lettsomian Lectures on "Tumors Complicating Pregnancy" says: "There does not appear to be any evidence of specially rapid growth of ovarian cysts during pregnancy." Others aver that they rapidly increase after conception, while still others assert they increase very slowly, if at all. Case II offers certain evidence that occasionally, at least, they not only increase in size, but the growth is rapid and enormous.

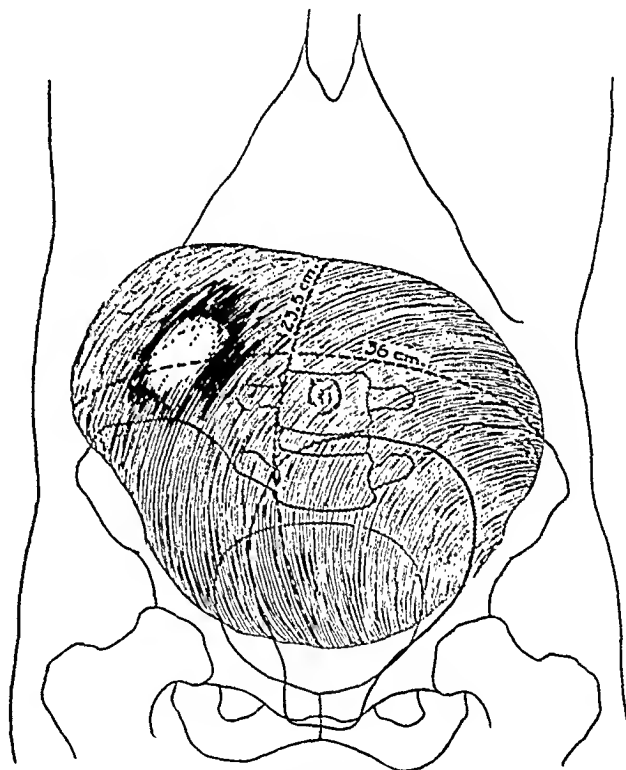


FIG. 5. CASE V. Ovarian cyst complicating puerperium. Pedicle twisted one and one-half turns. Patient in grave shock. Operation followed by recovery. Drawing shows cyst at its greatest size.

#### SYMPTOMS

Often the presence of the cyst causes no symptoms at all, or only moderate discomfort or pains attributed to the usual disturbances of pregnancy, but if the cyst grows to considerable size, the combined size of the uterus and cyst cause marked discomfort, sometimes severe pain and serious interference with the function of heart and lungs. In Case II, with the enormous enlargement, the patient experienced great difficulty in breathing and her heart-rate was very rapid.



The usual accidents to ovarian cysts that occur in the non-pregnant are even more apt to occur during pregnancy. According to McKerron, twisted pedicle has an incidence of 8 per cent in the non-pregnant, 12 per cent in the pregnant and 20 per cent in the puerperium (see Cases III and V). Incarceration in the pelvis is more common, due probably to the enlarged uterus and possibly to rapid growth of the tumor itself (see Case I).

Rupture of the cyst is surprisingly rare, and fortunately suppuration is not frequent. Necrosis occurs more often, probably due to pressure, and it is especially common in the puerperium, due to injury during labor. Malignant degeneration in ovarian cysts is not more common in pregnancy (Sir John Williams). Abortion is rather common; 26.6 per cent of Spencer's cases aborted.

#### DIAGNOSIS

Diagnosis is easy if the cyst is in the pelvis, but it is often missed entirely if the tumor is small and behind the uterus. In Munro Kerr's 18 cases only 5 were recognized during pregnancy. Our Cases III, IV and V were not diagnosed until after delivery and Case II, during labor.

In differentiating between myomata and cysts we must not forget that cysts, not rarely, feel as hard as fibroids, and on the other hand myomata may sometimes feel as soft as cysts. Especially is this true in pregnancy on account of the edema and increased circulation and rapid growth during gestation. Ascites may confuse us but it is seldom found with fibroids.

#### TREATMENT

*Early Pregnancy.* There is no difference of opinion as to the proper treatment of ovarian cysts discovered early in pregnancy. All authorities agree that they should be removed, whatever their size, type or location.

Spencer excepts lutein cysts with hydatidiform mole because they often subside spontaneously. Symptomless bilateral cysts,

if the woman is childless, may be left without operating because the operation may endanger the existing pregnancy, and the removal of the cysts, unless a portion of the ovary can be left, would leave her without hope of offspring.

*Late Pregnancy.* Sometimes the case is not seen, or the tumor is not discovered until late in pregnancy. In this case it may be thought advisable to pursue the plan of watchful waiting, at least until viability, in the interest of the baby, especially if the cysts be bilateral, small, and the woman childless. Near the end of gestation, or during labor, many writers advocate removal of the cyst, with subsequent delivery of the child per vaginam, and cesarean section only when the pregnant uterus offers insuperable obstacles to getting at the tumor. This seems to me entirely illogical for the reason that labor with a fresh abdominal wound is not to be viewed with entire equanimity and the good results following cesarean section under modern conditions entitle the woman to the advantage of "getting her troubles over" at one sitting. If the cyst be in the pelvis, one may be tempted to deal with it by vaginal section. This temptation, however, should be resisted on account of the difficulty of dealing with the pedicle and danger of infection. The procedure is particularly dangerous if the cyst be a dermoid.

Laparotomy offers much greater safety for obvious reasons. Of course if the surroundings are unfavorable for operation and the tumor is small, it is better to push the tumor out of the pelvis, if possible, and allow delivery to be accomplished normally. One may then deal with the cyst in the puerperium, if trouble arises.

If for any reason an ovarian cyst is not removed during pregnancy, labor, or the puerperium, the patient should be operated upon for this purpose as soon as she has sufficiently recovered to undergo the operation safely.

It must always be remembered that the child should never be dragged past the

tumor, because the results to the mother are exceedingly disastrous on account of injury to the tumor, which may be followed by necrosis and infection. We should be sufficiently impressed with the dangers of forcible delivery when we know that nearly one-third of the mothers die. Puncture of a cyst in the pelvis, obstructing delivery, is usually very unwise because of the danger of peritonitis, particularly if the tumor be a dermoid or infected. When one is tempted to puncture a cyst and the abdominal route seems not advisable, Munro Kerr says: "It is better to do a vaginal section, pull down the tumor into the vagina, ligate the pedicle if possible, and remove the tumor, but if this be impossible, freely incise and evacuate it, pass a loop of silk over the tumor with the ends drawn outside the vagina; then pack the tumor cavity with gauze,—extract the child as soon as possible; then pull down the tumor and ligate the pedicle."

The one exception is a broad ligament cyst which may be punctured and never return, but even here we advise the abdominal route.

Spencer's final paragraph on dealing with the treatment of ovarian cysts during labor is worthy of repetition here: "Induction of premature labor, forceps, version and simple tapping of a cyst as a means of overcoming the dystocia produced by ovarian tumors are absolutely contra-indicated."

#### CONCLUSIONS

Ovarian cysts complicating pregnancy, labor or the puerperium occur less frequently than myomata of the uterus, but they are always dangerous. Unlike the myoma, the presence of a cyst is a distinct menace in itself. Therefore, with very rare exceptions it should be surgically removed as soon as discovered, whatever its size, location or type.



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# EDITORIAL

The history of surgery is one of absorbing interest. No doubt the first operation was performed in the dim dawn of human life, crude, at best, and a torture to both patient and operator. But with the advent of chloroform and ether, the first real progress in surgical technique and discovery, as well as a minimum of suffering to the patient, was accomplished. Until Lister taught the scientific world the value of his teachings, surgery was a spirited stallion tied to a post. Then asepsis and antiseptics brought home to the operator the real meaning of a surgical conscience, and surgery leaped forward with phenomenal bounds. No longer was the abdominal cavity held in awe. With the passing of the decades the thoracic cavity, the brain, the female pelvis, the middle ear, the eye, and other regions were attacked fearlessly and successfully. Surgery passed from the realm of guesswork; it approached an exact science.

Ephraim McDowell has been called the father of abdominal surgery. He has also been given the appellation, "father of gynecology." We doubt if he was the true father of either.

With the inauguration of the 80's it was considered smart among many surgical groups to deny that gynecology had any standing as a specialty. Perhaps in the mauve decade this was reasonable. To-day the modern liberal-minded worker in the surgical sciences rightly gives gynecology a fixed place among the many surgical subdivisions.

Obstetrics has made great advances. It was once called, "The Art of Obstet-

rics," and it is still an art. But what art it possesses is overshadowed by its scientific attainments. Obstetrics is a science. Once the problem in obstetrics becomes abnormal, it enters the surgical column. Abnormal obstetrics, for the great part, being surgical, enters naturally as a subdivision of surgery, as a science and a specialty.

Among modern medical thinkers, gynecology and obstetrics are grouped in the same brackets. To be a finished gynecologist one must have had training in obstetrics; to be an obstetrician in the true sense, one must have a thorough knowledge of gynecology. For this reason the modern hospital no longer places obstetrics in the department of medicine. It functions best as a separate department, or combined with that of gynecology. This thought extends also to medical schools. The departments of obstetrics and gynecology serve best when under one director. That this is a mooted question, subject to endless debate, we readily admit, and offer it in no other sense than as the personal opinion of the writer.

Inasmuch as both obstetrics and gynecology are surgical specialties, and therefore should engage the thought of all surgeons, it was deemed a worthy idea to devote an issue of *THE AMERICAN JOURNAL OF SURGERY* to these surgical branches. With the idea in mind of giving to the readers a wide range of subjects and diversity of scientific thought this gynecological number is presented, consisting of contributions by gynecologists and obstetricians of eminence and wide reputation.

T. S. W.



# BOOKSHELF BROWSING

## A CASE REPORT WITH COMMENTS BY A MEDICAL SURGEON OF SOUTH CAROLINA

PUBLISHED 1818

THURSTON SCOTT WELTON, M.D., F.A.C.S.

BROOKLYN

IT is a human trait to share a joy, whether it be a rare thought, a newspaper clipping, a play or an undiscovered painting, with some one else.

This is also true of books. We read a novel, find it intrigues or stimulates the imagination, and lose no time in recommending it to our cronies.

One day, while browsing among the book shelves of the library of the Medical Society of the County of Kings, I picked up at random a small paper-covered pamphlet. The cover was a faded blue and worn with handling and age. As I toyed with this little volume, my mind occupied with an old edition of Smellie's Midwifery, my eyes took in the title: "An Analysis of the Subject of Extra-uterine Foetation." This aroused me from my speculations and lethargy.

The line, so common in books of the times, "Printed and Sold by G. Wright, Back of the Inns," captivated me.

Without more ado I sat upon a pile of medical journals waiting to be sorted and listed and, in the dim light, read John King's "Analysis" through.

In my mind's eye I saw this man of nerve and stout heart, this self-styled "Medical Surgeon," plying his calling, going from sick house to sick house, astride his horse, the saddle bags filled to bursting with pill, lotion and bleeding armamentarium, on Edisto Island, South Carolina.

In a letter dated June 4th, 1816, King wrote to the Editors of the New York Medical Repository offering his article for publication.

I have been unable to discover the date of the remarkable operation he described, but it must have been prior to 1816. Even today, with our advantages

## AN ANALYSIS

OF THE SUBJECT

OF

EXTRA-UTERINE FOETATION,

AND OF THE

RETROVERSION

OF

THE GRAVID UTERUS,

BY JOHN KING, ESQ.

OF South Carolina.

~~~~~  
Longum teneo, longumque tenebo. STAT.

.....Subeunt morbi, tristisque senectus;  
Et labor, et duræ rapit inclementia mortis. VIRG.

~~~~~  
Printed and Sold by G. WRIGHT, Back of the Inns,

And to be had of Messrs. Burks and Kinnebrook; and  
Parsons; Booksellers, NORWICH; Callow, *Medical Book-*  
*seller*, Crown Court, Wardour Street, LONDON; Alexan-  
der, YARMOUTH; and Mann, LYNN.

1818.

of modern hospitals, operating rooms, trained residents, anesthesia and aseptic surgical technique, the case would be worthy of report. That John King, Esq.,

did the operation on a table in the patient's home, the patient conscious, as will be noted in the text, makes this case-report the more remarkable.

King met with a woman in labour four days. The woman had an abdominal pregnancy. King delivered her by the vaginal route, the mother and child surviving.

In his Dedication, a mere nothing of four and a half pages, to Edward Rigby, Esq., M.D., F.L.S., of Norwich, England, among other things King writes, "A method of delivering women under circumstances detailed in this paper, has long been a desideratum in obstetric Surgery, and although details of cases, by Sabatier and other Continental as well as British Accoucheurs, are to be found, yet the Medical Annals of Europe and America, do not yield an evidence, where the lives of both the parent and child have been saved, and that too, without any remaining mutilation or deformity, and recovered with the same expedition as is usual in the most fortunate parturition."

If this be true, this case report is of value from an historical viewpoint. It would be interesting to discover if any physician prior to King's achievement had performed this operation with recovery of mother and child and recorded it in the literature.

In this brief result of Bookshelf Browsing I will not consider King's remarks on the Retroversion of the Gravid Uterus. To those interested this book may be procured and read at leisure.

But I cannot refrain from quoting in full the account of the case of Extra-Uterine Pregnancy and do so with the hope that its perusal will prove as fascinating as it did to the writer of these lines while he sat in the dimly lighted alleyway between the book stacks.

#### CASE

Of an extra-uterine Foetus, produced alive, through an Incision made into the Vagina of the Mother, who recovered after delivery,

without any alarming symptoms, by Doctor John King, of South Carolina.

The experiments of celebrated Physiologists have established, upon the most incontrovertible grounds, the theory of conception. We are now certain that a prolific geniture is the result of the application of the fecundating principle of the semen masculinum to the Female ovum, in the sexual intercourse, this position, however, has been disputed in ancient records; and it has been asserted, that prolific absorption had occurred from inadequate coition, and also from effusions in tepid balnea.

Confessions of individuals assure us, that a constricted Vagina, has absolutely prevented voluptuous copulation, and, nevertheless, a prolific geniture had taken place.

We do not intend to dilate upon this subject physiologically, but to confirm and establish the investigations and correct experiments of Drs. Hunter, Monro, Haighton, and others thereupon.

The venereal orgasm exciting the whole uterine system, and contractility in the fallopian tube and ruffle, causes the ruffled extremity to embrace the ovary; and by virtue of reciprocal action, attraction of the attractive parts, and exfoliation of the evolving parts, concur to make escape the ovum occluded in the ovary, into the palm of the ruffle; and then as it were by a capillary attraction, the vesicle progresses through the tube to the fundus uteri, to undergo the formative process of gestation.

Now and then, the regular functions of the female tubes become interrupted—the fimbriae may lose their contractility—the fallopian tubes their elasticity—obstruction from inflammation, may hinder the passage of the vesicle through the tube, from concremented mucus, or gluten; however this may happen we are sure that the ovum is occasionally deposited in the abdomen by falling from the ovary, and not seized upon by the ruffled extremity of the tube; then the ovum becomes attached to the sides of the external uterus, the intestines or mesentery, or remains on the ovary itself, and ventral gestation is assumed by those parts, sometimes too, the vesicle proceeds no farther than the tube, and gestation is completed there. The term of accretion being ended, pains of distension take place, labour supervenes and the reiterated efforts of nature at length excite inflammation,

suppuration, and abscess. The foetus always perishes, and the mother presents a spectacle of commiseration.

*Omni miseria cumulata mater.*

That these deplorable circumstances occur, the reader may be well assured, by consulting all the writers on the subject of extra-uterine foetation.

It is not my intention to detail all the circumstances of suffering and deformity of mental and bodily distress, which await the unhappy mother of a foetus bred ex utero, but they may be easily imagined.

The woman in question had been four days in labour, without, however, any of the ordinary signs, yet the pains returning in the manner of natural labour, the patient wearied out with these unprofitable efforts, desired assistance, on my arrival I examined per vaginam, and found that the os uteri could no where be felt.

Having never met with a case of this kind before, I revolved in my mind the method of delivering this unfortunate woman, and of saving the lives of both mother and child.

The operation was simple, and consisted in laying the vagina open to a great extent.

The head of the foetus floated and vacillated on the right side of the uterus, and pushed the uterus from its situation. I introduced a small bistoury, guarded by the end of my finger, as far as I possibly could, so as completely to embrace the circumference of the head, and thereby prevent any laceration of the parts in the progress of delivery.

I then pierced the vagina through, and carried the knife five or six inches downwards and backwards, so as to insure the easy extrication of the child's head.

The instant the vagina was laid open, the waters flowed abundantly, the membranes being laid open with the same incision.

I then introduced my hand through the wound in the vagina, and found the infant very high up, and firmly fixed, without any prospect of its descending into the Pelvis.

As we could derive no help from the contraction of the uterus in this case, and all the efforts of the mother depending on the contraction of the recti, transverse, and oblique abdominal muscles; I therefore desired the assistants to press gently and constantly upon the abdomen, and to imitate a circular descending motion with their hands.

The mother, animated thereby with the prospect of delivery, redoubled her efforts, and with the help of the vectis, I perceived the head to advance by slow degrees into the pelvis and I afterwards, with the forceps, completed the extraction, after a long and uninterrupted exertion. It appears, therefore, that the abdominal muscles alone are insufficient for the expulsion of the foetus, I was very sensible of this, and must greatly attribute its descent to the external co-operation of the assistants, with the use of the vectis on the child's head.

It would have been proper to have turned the child, if the above endeavours had failed.

The child appeared to be still-born, but not being certain of that, I inflated the lungs through a tube, and was pleased to find it had borne the brunt of the day without a fatal event.

The hemorrhage, for this large incision was inconsiderable, and by no means capable of exciting any alarm, and was of use in moderating the adhesive inflammation. The Infant was of the common size, and well conditioned. The placenta was uncommonly small, and the funis umbilicalis remarkably thin, so that it ruptured on the evolution of the infant, though without any hemorrhage.

The part to which the placenta adhered, whether the ovary, the mesentery, the intestine, or the parietes of the external surface of the uterus, did not probably afford so easy an accommodation to the new economy thus instituted, and therefore circumscribed the boundaries of the placenta within narrow limits; yet the foetus was well nourished and plump. The umbilical arteries carrying a smaller column of blood through this diminished funis, the mother probably, had undergone a longer gestation than usual. It is not my object, however, to animadvert on that phenomenon.

The morning after delivery, I extracted a full bleeding from the arm, and repeated an anodyne. I left the patient without complaining; and on interrogating her afterwards with respect to the operation with the knife, she declared that she did not know I had used one. This circumstance must hold out a great encouragement to perform the incision, in every case of extra-uterine foetus. I had caused her to lie on an inclined plane, upon her back, with the head very low.

I was not able to see her again until the third day. I then found her state uncomfort-

able, with pain over the pubes; and on examination per vaginam, discovered the intestine pushing at the wound; the wound itself being much contracted.

I ordered her to lie on the left side, with the hips more elevated, to favour the retraction and gravitation of the intestines from the wound. This uneasy position favoured our views, and answered our expectations, I caused a blister to be applied over the pubes, and prescribed a saline anodine mixture, to be taken three or four times a day, I made it an object to constipate the bowels for ten days, until the danger of any hernial protrusion was over.

In two weeks, this woman, without my consent, walked about. I then found the intestine could no longer protrude through the wound, under any circumstances of

posture. In two weeks more, I could not discover that there had been any incision made in the vagina. The uterus resumed its natural site; though I am persuaded, its whole body had wasted during this extra-uterine gestation.

The event of this case is a certain proof that every infant, so situated, may stand a great chance of being delivered alive, and no harm whatever can accrue to the mother, *coeteris paribus*, from the operation.

The shocking accounts of extra foetal cases I have read in different publications and never having seen or heard of Infants being delivered alive, thus circumstanced, is my reason for troubling the medical world with this trifle; which if it should prove either useful to them or serve the cause of humanity, I shall be highly rewarded for my pains.





# PROGRESS IN SURGERY

*Selections from Recent Literature*

DEBIASI, E. Factors which affect prognosis in the radiotherapy of cancer of the uterus. *Radiol. med.*, October, 1926, xiii, 719-726.

The material of Döderlein's clinic includes about 2700 cases of carcinoma treated since 1913 exclusively by radium or roentgen rays. The author considers only the cancers of the cervix in his discussion. The chances for recovery of these patients depend not only on the extent of the tumor but also on various other factors, among them the morphological character of the tumor. Carcinomas with immature cells present a more favorable prognosis than ones with highly differentiated cells with a tendency to cornification. The condition of the organism as a whole also helps to determine the outcome, as shown by the great difference in results obtained in women whose age, general condition and economic status varied greatly. The largest number of cures was between the ages of forty-five and fifty, the lowest between fifty-five and sixty. Women of means of course present a better prognosis than poor ones, not only because they can have better food and take better care of themselves but because they consult the physician on the first signs of disease while the poor ones defer it as long as possible. The condition of the blood is important. According to Wintz a leucocyte count of less than 2500 with lymphopenia and a hemoglobin of less than 40-35 per cent should be regarded as absolute contraindications to radiotherapy. With regard to the effect of other diseases on the prognosis, it seems that diseases of metabolism and chronic infections do not have any special effect. Active tuberculosis of the lungs contraindicates the treatment. Goiter has no particular effect on the prognosis. But there seems to be a relation between the function of the hypophysis and cancer of the genitals. Hofbauer noticed that irradiation of the hypophysis brought about involution of a carcinoma of the vulva. Irradiation of the hypophysis has been practiced systematically in the clinic of Monaco since 1923. The patients given this treatment have shown an extraordinary increase of weight, much greater than before this method was adopted. Radiotherapy is dangerous in patients with virulent streptococcus infections; according to Döderlein a virulence test should be made before any diagnostic or therapeutic use of rays. Another factor which affects prognosis is the weight of the patient.

Patients who show a progressive decrease of weight never recover.

GRÉGOIRE, RAYMOND; BÉCLÈRE, CLAUDE, and DARBOIS. Roentgen diagnosis in gynecology. *J. de radiol. et d'électrol.*, Jan., 1927, x, 1.

This is a discussion of the indications, technique and results of roentgen diagnosis of gynecological diseases by means of the injection of lipiodol. The authors find that the intrauterine injection of lipiodol performed under strictly aseptic conditions and with a measured and constant pressure of 30 cm. mercury is entirely harmless and even if some lipiodol passes into the peritoneal cavity, it does not do any damage. This method of gynecological diagnosis has given very valuable results. It is indicated in the diagnosis of tumors of the pelvis, in metrorrhagia and in demonstrating the permeability of the tubes. The final diagnosis must be based on a combination of the clinical and roentgenoscopic findings and a study of the simple or stereoscopic roentgenograms made from in front and from the side. In fibroma there is generally a very characteristic picture of an enlarged and more or less deformed uterine cavity. In a few rare cases where the cavity is normal or decreased in size the passage of a lead wire around the tumor aids in the diagnosis. In case of cysts the picture of the uterus is generally normal, the tubes are often permeable and there is a lateral tumor. A great degree of deviation of the tubes suggests an intraligamentary tumor. In tumors of the tubes the picture shows the tube obliterated at the site of the tumor and more or less distended in front of it by the injection. If the tube is permeable it shows that it is normal.

In metrorrhagia there may be a lacunar intra-uterine picture or a change in the outline of the cavity. This shows the exact site of the lesion and an exploratory excision may then be made which will show whether it is due to retained placenta, polyp or a tumor of the body of the uterus. Roentgen examination with lipiodol gives information in regard to the permeability of the tubes which cannot be obtained in any other way. It shows whether each of the tubes is permeable and if one or the other is occluded it shows the exact site of the obstruction and enables the surgeon to perform a plastic operation to restore permeability.

This exactness in diagnosis cannot be obtained unless a measured and constant pressure is used.

The article is profusely illustrated with roentgenograms and the following article by G. Cotte and Pierre Bertrand on pages 24 to 29 of the same journal consists entirely of 24 roentgenograms of the uterus and tubes after injection of lipiodol with legends beneath them describing the nature of the case and the roentgen findings.

HERGER, CHARLES C., and SCHREINER, BERNARD F. Strictured ureters, hydronephrosis and pyonephrosis occurring in cancer of the cervix uteri. *Surg., Gynec. & Obst.*, December, 1926, xliii, 740-743.

An investigation was made of the bladders, ureters and kidneys in patients suffering from cancer of the cervix uteri. In all, there were 32 autopsies performed and 21 showed gross pathological changes in the urinary apparatus consisting of strictured ureters, hydronephrosis, pyonephrosis, caseous kidney and infiltration of the bladder. In addition, a clinical study was made of 50 cases of far advanced cancer of the cervix to determine the frequency with which the above lesions occurred. Fourteen of these cases on cystoscopic examination showed definite ulceration and infiltration of the bladder mucosa in the region of the trigone. The remaining 36 cases showed an elevation of the area just beyond the trigone which was covered either with normal mucous membrane or was edematous in spots. The phtalein renal function test was performed on 22 cases and it was found to be 30 per cent or less in fifteen minutes in 8 of these cases and between 30 and 62 per cent in 14 cases.

Pyelograms were taken, the effort being made to include the whole kidney region, ureters and bladder to show strictures in the broad ligament area or at the brim of the pelvis as well as the dilatation of the ureters. Five were without any obstructive lesion and 9 cases showed some evidence of ureteral or pelvic dilatation. In 6 cases, it was impossible to pass a ureteral catheter beyond the strictured area. These obstructions occurred most frequently in the lower 2 inches of the ureter. Twenty-four of the 50 cases showed hydronephrosis or dilatation of the ureters due to stricture of varying degrees in one or the other ureter, or both. This was divided as follows: left ureter 6, right ureter 11, both ureters 7.

It is concluded that these strictures are the result of pressure on the ureter from invasion of the broad ligament or bladder wall. In advanced carcinoma of the cervix uteri about half the cases showed obstruction of the ureter,

with hydronephrosis and pyonephrosis. Even after complete eradication of the disease by radiation therapy, one patient died from kidney insufficiency in which autopsy showed cervix, uterus and broad ligament areas free from cancer.

JUNG, PAUL, and SCHIRMER, A. On the combination of the pneumoperitoneal roentgenogram of the organs in the small pelvis of the female with hysterosalpinography. *Acta radiol.*, Oct. 15, 1926, v, 395-407.

The ordinary pneumoperitoneal roentgenograms of the small pelvis in the female have been encumbered by difficulties in interpretation particularly in respect to the relationship to neighboring organs. By a combination with salpingo-hysterography, i.e., the contrast filling of the uterus and tubes with lipiodol, the interpretation of the roentgenogram is greatly facilitated in diseases of the adnexa, tubal pregnancy, the differentiation of adhesions and diseases of adjacent organs, etc.

Salpingo-hysterography alone, for testing the patency of the tubes, has the great advantage over simple tubal insufflation of being an optical method less liable to subjective misinterpretations than the merely acoustic one. In connection with pneumoperitoneum it enables one to learn something of the nature and location of the obstruction and in addition gives better information regarding the shape and degree of development of the uterus. In the diagnosis of intrauterine changes (tumors, polyps, irregularities in the mucosa), salpingo-hysterography should be quite fully able to replace the complicated and not harmless method of dilatation and palpation of the uterus cavity. It is in this field that the combined methods of pneumoperitoneal roentgenography and salpingo-hysterography will in the future find their main field of usefulness in gynecological diagnosis.

The authors have employed the procedure in about 150 cases and have observed no after-effects. A series of 19 illustrative roentgenograms is reproduced.

STEIN, IRVING F., and ARENS, ROBERT A. Iodized oil and pneumoperitoneum combined in gynecologic diagnosis: preliminary report. *J. Am. M. Ass.*, Oct. 16, 1926, lxxxvii, 1299.

The woman, aged twenty-five, had been married three years and was sterile. Examination revealed a mass in the right adnexa, almost fist-sized, which was adherent and tender. The cervical examination was negative. The Fallopian tubes were found patent by the passage

of carbon dioxide at a pressure of 80 mm. After 1 liter of gas was thus introduced into the peritoneal cavity, 2 c.c. of lipiodol were injected into the uterus through the same cannula. The patient was then placed in the partial knee-chest posture and stereoroentgenograms were made. It was found that both tubes admitted lipiodol through their entire length and there was no tubal pathologic change. The right ovary was cystic, about 7 cm. in diameter and adherent to the bowel. These adhesions were clearly visible.

BOWING, HARRY H. Menorrhagia and metrorrhagia due to certain benign diseases of the uterus, and their treatment by irradiation. *Radiology*, September, 1926, vii, 234-241.

When radium is available and can be applied directly to the uterine walls by way of the uterine canal, it is the method of choice. It should be supplemented with roentgen-ray treatment when the fundus is larger than a five or six months' pregnancy. When radium is not available, roentgen rays used alone are effective and as a rule must be repeatedly applied for some months. A thorough clinical examination and operative treatment where indicated are essential. The mental state of the patient should not be ignored.

The results of radium treatment at the Mayo Clinic have been generally satisfactory, because the cases were carefully selected and therapy was judiciously applied. When small and moderate doses of radium are used, it may be necessary to repeat them from time to time with an interval of several months elapsing between treatments. Provided the risk is not great, an operation is better than repeated applications of radium.

The result may occur immediately or after an interval of six or eight weeks. In some a gradual lessening of the quantity of the flow is noted. A few patients report an excessive flow at the period following the application of radium. When large fibromyomas are present, many months are required for their reduction.

The dose of radium radiation in these cases was small, moderate or large, depending on the condition. The small dose consisted of 200 to 300 mg.-hr.; moderate, 300 to 600 mg.-hr.; and the large dose (the menopause dose) varied from 700 to 1200 mg.-hr. The supplementary roentgen treatment had the following dose factors: 200 kv., 5 ma., 0.75 mm. Cu plus 2.0 mm. Al, 50 cm. distance, two 20 X 20 cm. fields, one on the anterior abdomen and one posterior, one hour exposure for each field. Fibromyomas require only one treatment when the uterus is of the size of a five or six months' pregnancy; but if the size should be greater the treatment

may be repeated. The author questions the value of further treatment if amenorrhea supervenes.

FARRAR, LILIAN K. P. The reaction of the tissues to radium in treatment in cancer of the cervix and the importance of lacerations in producing cancer in this location. *Surg., Gynec. & Obst.*, December, 1926, xliii, 719-723.

In the cervix, the reaction to radium treatment is so nearly uniform that the appearance of the cervix each month after treatment can be predicted if the case is progressing favorably; one can also tell when the maximum effect of radium has been reached and a further dose is needed. Cancer of the cervix when treated by radium shows a progressive course toward contraction of the cervix and inhibition of the cancer cells in well-defined stages of (1) hyperemia; (2) slough; (3) healing, and (4) contraction.

*Stage of Hyperemia.* One week after the initial dose of radium the tissues of the cervix are intensely red and hyperemic. The blood vessels are engorged with blood and it is for this reason that the author does not consider the case should be irradiated if an immediate operation is imperative.

*Stage of Slough.* One month after irradiation the cervix usually shows an extensive green slough and a foul discharge from the broken-down carcinoma. This slough must be entirely separated from the cervix before a hysterectomy can be performed without great danger of peritonitis resulting from cutting into this necrotic tissue. It is emphasized that not every case progresses at the same rate of speed, even when favorable results are obtained.

*Stage of Healing.* This is reached usually two months after irradiation. The appearance of the cervix is now completely changed as the slough has separated leaving a smooth, clean, dusky red cervix which may be somewhat glazed but has clinically no evidences of carcinoma. This is followed by a *stage of contraction* in about a month. The development of connective tissue which is excited by irradiation markedly reduces the size of the cervix and also the vault of the vagina. Large carcinomatous growths or even craters become contracted to a normal or smaller than normal cervix and the vault is as narrow as that seen in senile vaginitis. Following this occurs the *final stage*, that of *marked contraction*. The increasing amount of connective tissue squeezes the tissues of the cervix until the latter is finally so shrunken as to leave a superficial resemblance to an amputated organ. Little or no vault to the vagina is left and the mucous membrane is pale, with only an occasional blood vessel in sight. It is only when this stage is reached that

the result of radium treatment is regarded as clinically satisfactory.

An inspection of the cervix invaded by carcinoma revealed the great frequency with which lacerations were present. A study was made of 300 consecutive case histories of cancer of the cervix at the Woman's Hospital, New York, to determine the incidence of pregnancy. In 288 of these cases (96 per cent) pregnancy had been present. One hundred and fifteen of the patients had had 5 or more pregnancies, and 35 of these had had from 10 to 23 pregnancies. Nearly all the histories showed hard labors or instrumental deliveries, and frequently there was the specific statement that the patient had been badly torn. In 288 cases of cancer of the cervix 11.1 per cent of the patients had had the last pregnancy less than five years before entering the hospital for cancer of the cervix, and 20.3 per cent had had the last pregnancy less than ten years before entering the hospital with cancer of the cervix.

A careful palpation and visual inspection of every cervix immediately after the confinement and an Emmet trachelorrhaphy performed for lacerations in the cervix would, it is believed, lessen the danger of cancer development in the cervix later. Intermediate or secondary repair of the lacerations should be made when conditions do not warrant an immediate repair.

MASSON, JAMES C. Myomectomy, hysterectomy and radiotherapy in fibromyoma of uterus. *J. Am. M. Ass.*, Nov. 6, 1926, lxxxvii, 1530-1533.

The danger of a fibromyoma becoming sarcomatous or initiating a carcinoma in the uterus is slight; sarcoma develops in about 2 per cent and carcinoma in about 4 per cent of patients treated surgically. It seems that radium is advised too frequently in the treatment of fibromyoma both by those who have a limited amount of radium at their disposal and those inexperienced in its use. Surgery is often a more conservative treatment than the administration of even small doses of radium or roentgen rays.

Radiotherapy is indicated for all patients over forty, who have fibromyomas less than 15 cm. in diameter with metrorrhagia as the chief complaint. It is also indicated if the patient is under forty and refuses surgical removal, or if a major operation might carry an added risk. It is also indicated in all cases of fibrosis uteri or cases in which there are essential uterine hemorrhages.

Surgical treatment of fibromyomas is indicated for most patients under forty; for most

patients with pain or irritability of the bladder; for patients with tumors more than 15 cm. in diameter; for those whose tumors are of the pedunculated or submucous type or undergoing degeneration or inflammation; for those whose tumors may not be fibromyomas and for those with complications that require the opening of the abdomen. Abdominal myomectomy is the operation of choice for a majority of patients under forty. Vaginal myomectomy is indicated if the fibromyoma presents through the cervix.

Abdominal hysterectomy is especially indicated in cases showing marked secondary anemia when further loss of blood might have serious consequences. In such cases transfusion is given, and provided there is no reaction it is followed in twenty-four hours by hysterectomy, a procedure which is safer than radium, as bleeding sometimes continues for several weeks after irradiation and demands repeated transfusions. Furthermore, if the tumor is degenerated cachexia will be increased.

It is emphasized that there are well-defined fields where either surgery or radiotherapy exclusively can yield satisfactory results. The best interests of the patients are disregarded by the therapist who insists on radiotherapy indiscriminately just as much as by the one who adheres exclusively to surgery.

A report is given of a case observed in a woman aged fifty-one who had a uterus about the size of a three months' pregnancy and containing multiple small fibromyomas. Radium was advised but the patient refused any treatment except surgical. Total abdominal hysterectomy was performed with removal of both tubes and ovaries. Two distinct squamous cell epitheliomatous nodules were discovered by the pathologist in the left ovary. In this case much valuable time would have been lost had the patient not insisted on surgical treatment.

PLAUT, ALFRED. The relation of prognosis to the histological findings in carcinoma of the cervix. *Surg., Gynec. & Obst.*, October, 1926, xliii, 450-458.

There is at present no reliable basis for a histological prognosis in cervical carcinoma. The histological picture of cancer of the cervix does not permit the establishment of well-defined groups according to the type of cancer cell. The establishment of relations between cell type and malignancy is impossible at present owing to the lack of exactly definable cell types. It may be suggested that a classification on the basis of radiation sensitiveness might be made; but since the effect of radiation is three-fold, namely, caustic destruction, autolytic degen-

eration and growth retardation, the problem of classification becomes complicated.

Constitutional factors must be considered in determining prognosis; and the influence of age must be studied over again since existing data are unsatisfactory. The clinical classification of carcinoma of the uterine cervix is still the best aid in making a prognosis; and the general histological aspect of the tumor may be an aid.

These conclusions are the result of a study of the material from patients admitted to the Woman's Hospital, New York, for radium treatment of cervical carcinoma. The classification of Martzloff was followed in an attempt at histological prognosis. The analysis of over 149 cases shows, however, that prognosis on the basis of cell type is not possible in cervical carcinoma.

NEAL, M. PINSON, and ROBNETT, DUDLEY A.

Generalized osseous metastases secondary to atrophic scirrhous carcinoma of left breast. *Arch. Surg.*, February, 1927, xiv, 529-541.

A report is given of a case occurring in a woman aged fifty-six in whom there was present an unrecognized, untreated, atrophic scirrhous carcinoma of the breast with bone metastases that were more massive and widespread than any reported in the literature and extended to such unusual regions as the malar, superior maxilla, clavicle, tibia, fibula, and the foot. The osseous involvements were primarily of the bone medulla with extension to the cancellous bone and bone surfaces, indicating blood-borne metastasis. The tumor was in existence, without the disease being recognized sufficiently long for the occurrence of widespread secondary growths, multiple spontaneous fractures with callus formation abundant in tumor tissue, and deformities incident to bone resorption.

RANDALL, LAWRENCE M. Lipiodol injection of the uterus and oviduct. *Am. J. Obst. & Gynec.*, April, 1927, xiii, 457-466.

Lipiodol has been used for the last six months in the Mayo Clinic and during this time the Rubin test was made in 85 cases. In 18 of these women with closed oviducts, the tubular inflation was followed by lipiodol injections and roentgenography. On the basis of the roentgenographic findings following the lipiodol injection, 6 of the 18 women mentioned might expect success from operative treatment if the tubular condition alone were considered. One of these was refused operation because the husband's Wassermann test was positive. Another had a fibroid uterus which was believed to prejudice her chances. Of the remaining 4 two have been operated on, one at the Mayo

Clinic and the other elsewhere. The former is now four months pregnant. In both of these cases the pathologic changes evident at operation confirmed the pre-operative diagnosis made by the roentgenogram.

The technique of lipiodol injection of the uterus and oviduct is simple and apparently accurate. A Record syringe is used connected to the ordinary inflation cannula. The average amount of oil used is 5 to 6 c.c. The cervix uteri is caught with a tenaculum after being exposed with a bivalve speculum. The cervical canal is thoroughly cleansed with dry cotton applicators, after which tincture of iodine is applied and wiped dry. The cannula is inserted after all air has been expelled from the apparatus. Gentle pressure is made on the plunger of the syringe until the patient complains of uterine colic. Pressure is then released for a moment and reapplied until the same reaction occurs. This is repeated once more and the roentgenogram taken with the cannula still in place. Roentgenograms are made with the patient in the same position as for the injection, care being taken to see that she does not move or breathe during the exposure.

CLARK, JOHN G., and FERGUSON, L. K.

Carcinoma of the cervix uteri as treated in the Gynecologic Department of the University Hospital (Philadelphia) (Series II, 1919-1923). *Am. J. Obst. & Gynec.*, February, 1927, xiii, 144-156.

A group of 184 cases serve as a basis for this report, of these 94 were treated five or more years ago, and 13 are living, or 13.8 per cent apparent cures. Three years have passed since treatment in 161 cases with 27, or 16 per cent apparent cures. The first symptom in three-fourths of the cases concerns hemorrhage in some form. Of all those who came for treatment within six months from the time of their first symptom 60 per cent were inoperable. A case treated during the first six months of the disease has one chance in seven for a five-year cure; a case treated after the first six months has one chance in twenty-six for a five-year cure.

In this series there were 13.5 per cent adenocarcinomas and 86.5 per cent epitheliomas. Approximately the same results were obtained in the treatment of each type. The older the patient, the better the prognosis for prolongation of life or actual cure of the disease. Radium was effective in temporarily relieving hemorrhage and discharge in 75 per cent of the cases treated. Pain may be relieved for a time but in a considerable number of cases pain seems to be increased by irradiation. The average duration of relief of symptoms

was about one year. In all classes of cases radium alone cured 4 in 68 cases, 5.9 per cent five-year cures with an operative mortality of 1.4 per cent. Cautery, amputation and radium cured 6 in 14 cases, 42.9 per cent five-year cures with an operative mortality of 10.6 per cent.

In Group A cases radium alone cured 2 out of 7 patients, 28.5 per cent five-year cures, cautery and radium cured 5 out of 6 cases, 83 per cent five year cures. In Group B radium or cautery plus radium gave no five-year cures in 11 cases. There was one case of hysterectomy plus radium living five years. In Group C radium alone cured 2 in 39 cases, 5.1 per cent five-year cures. Cautery and radium cured 1 in 5 cases. In Group D there were no five-year cures in 9 cases.

FLUHMANN, C. F. Carcinoma of the cervix uteri; a clinical and pathologic study. *Am. J. Obst. & Gynec.*, February, 1927, xiii, 174-184.

A series of 110 cases of carcinoma of the cervix uteri was studied. No relation between the age of the patient and the type of the tumor could be established. The disease was limited to the cervix in 28.1 per cent of the cases. No relation could be found between the clinical appearance of carcinoma of the cervix uteri and the histopathologic groups. It was impossible to determine the extent and duration of the disease from the length of time that symptoms had been present.

The radiosensitivity of the different pathologic groups is still a matter of controversy. The author furnishes evidence supporting the view that the immature forms do better under radium treatment. The presence of large numbers of eosinophiles in microscopic sections of carcinoma of the cervix may be a favorable prognostic sign when treatment with radium is employed. Somewhat less than half of the cases in this series have been treated with radium and present sufficiently complete histories. Eosinophilia was present to a marked degree in 11.9 per cent of the sections examined.

KIMBROUGH, ROBERT A., JR., and NORRIS, CHARLES C. Factors influencing end-results in carcinoma of the cervix after irradiation. *Am. J. Obst. & Gynec.*, March, 1927, xiii, 279-287.

The conclusions are given on a combined

clinical and histologic review of 120 cases in addition to a clinical review of 263 cases in another series. Histologically the fat spindle or basal celled tumors appear to be the most malignant. The best immediate results were found in the basal celled type. The best end-results were obtained in the prickly celled tumors. The high grade of malignancy of the basal celled tumor is probably offset by its greater susceptibility to irradiation so that the end results are practically the same in all histological types. The ultimate mortality increased in direct proportion to the extent of the disease at the time of the first treatment. Of the cases of recurrence after radical hysterectomy 12.8 per cent were living and well five years after irradiation.

The papillary form of cervical carcinoma gives a somewhat more favorable prognosis than the infiltrating type. The best results were obtained in patients between the ages of fifty and fifty-five years. Those under forty or over sixty-five years of age responded poorly to treatment. The total five-year salvage in 263 cases was 13.7 per cent. The stage of the disease at which treatment is instituted is decidedly the greatest prognostic factor in cancer of the cervix and is more important than the histologic type of growth.

MUNDELL, JOSEPH J. Cancer of the cervix complicating pregnancy, showing the harmful effects of radium on the fetus. *Am. J. Obst. & Gynec.*, January, 1927, xiii, 86-91.

A report is given of a case occurring in a woman aged twenty-five. She was found to have carcinoma of the cervix of the uterus which was regarded as inoperable. A total of 2150 mg.-hr. of radium was administered in three treatments on alternate days. Thereafter the patient's condition became much worse and two months later a total of 2100 mg.-hr. was again applied. For two days following there was more or less cramp-like pain and she aborted a three months' fetus. The author was unaware that the patient was pregnant, thinking the increase in the size of the uterus was due to the advancing growth of the cancer. The patient died nine months after onset of the symptoms. The disease seemed to progress more rapidly and to be very virulent. There was nothing in her history to indicate a suspicion of pregnancy at the time of examination.





## MYOFASCITIS

### A PATHOLOGICAL EXPLANATION OF MANY APPARENTLY DISSIMILAR CONDITIONS

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**M**YOFASCITIS is a local manifestation of a toxic condition of the blood, evidenced by low grade inflammation or toxic involvement of the muscles and fasciae, the symptoms predominating at the fascial insertions of muscle to bone. Pull or traction on these sensitive fascial insertions produces marked symptoms, out of all proportion to the degree of inflammation that is evident clinically. In 90 per cent of cases the toxic absorption is from the colon; in the remaining 10 per cent the toxic focus may be found in the oral cavity, the sinuses of the skull, the tonsils, or the genitourinary tract.

In twenty years of practice I have been increasingly impressed by the large number of persistent cases of low back pain, lumbago, sacroiliac strain or relaxation, sciatica, strain of the lumbar muscles, or muscular rheumatism, and also certain cases of tennis elbow and of weak or flat-foot that are referred to me for differential diagnosis and relief, in which treatment based only on these various local diagnoses had proved singularly unsuccessful. Gradually the conviction grew that in a large number of cases the diagnosis was empirical, the true pathological condition being toxic absorption, usually from the colon, with local manifestations in the muscles

and fasciae, particularly at the fascial insertions of muscles to bone. Treatment based on this conception was begun five years ago, and the results have been so good in a large number of cases that I suggest the introduction of the term "myofascitis." The compound word seems desirable in that the symptoms are so combined that both muscles and fasciae are affected.

That medical terminology, already cumbersome, should not be unnecessarily increased is axiomatic. The introduction of this term, myofascitis, is therefore made only after careful deliberation and the conviction that it simplifies rather than complicates our diagnostic armamentarium, and points the way to one definite general line of treatment, supplemental to orthopedic indications, instead of a multiplicity of methods yielding unsatisfactory results. It clearly describes a clinical entity which has hitherto been empirically classified under such varied terms as those listed above, because there was no term in the accepted nomenclature which actually described it.

At least 90 per cent of the cases of "low back pain," "lumbago," "sacroiliac strain" and "sciatica" that are referred to me under these diagnoses are, on more comprehensive analysis, instances of myofascitis; and certain cases of the latter condi-



tion produce many of the symptoms of flat-foot and tennis elbow. It therefore seems highly desirable from the standpoint of both patient and physician that a definite line be drawn between true sciatica, true sacroiliac relaxations, etc., and cases of myofascitis which simulate these conditions.

The recognition of myofascitis as a clinical entity will not only result in the cure of cases that have been persistently resistant to treatment but, by eliminating the large number of pseudo-sacroiliac strains, etc., it will give us a more correct conception of the prognosis for these conditions because it will be based on exact pathology.

#### TOXIC ABSORPTION FROM THE COLON THE UNDERLYING FACTOR

The theory on which I worked in studying the problem was that the condition was primarily due to toxic absorption, usually from the colon, with clinical manifestations at the fascial insertions of muscles. With this theory as an hypothesis, I first examined the patients for toxic absorption from teeth, sinuses or tonsils, attention being given to anything outside the colon that might contribute to the symptoms. But the total of such foci was only approximately 10 per cent, whereas about 90 per cent of the patients had symptoms referable to the colon: headaches, constipation, and other signs of toxicity. The medical profession is often misled in relation to the colon because the patient will deny being affected with constipation or any intestinal disturbance, when persistent questioning in the face of this denial, and more especially examination of the feces, will reveal the fact that although the bowels move regularly, peristalsis has been slowed up and, as someone has aptly expressed it, the train comes in on time, but it is yesterday's train. In other words, the movement is inadequate, and toxic material is therefore constantly being held in the colon. Frequently after an excessive bowel movement the toxic symptoms diminish temporarily.

I had the fecal matter examined thoroughly and found that the normal gram-negative flora were reduced in number, in several cases to as low as 30 per cent, whereas the proportion of gram-positive flora was markedly increased. The abnormal chemical, histamin, was present in variable amounts. Histamin is regarded as a pathological end-product and shows that intestinal disturbance has gone on to a point where it may endanger any portion of the body from the toxic standpoint. Hashimoto of the Mayo Clinic has made a valuable study of the production of this chemical in the colon, and its effects upon the systemic circulation.

In many cases a considerable residue of cellulose or protein formic acid was noted, and the stool proved acid to all indicators. Instead of *B. coli* predominating as it does normally, and thus checking the growth of pathogenic bacteria, a very small percentage of this organism was present. From the bacteriologic standpoint, Hiss and Zinsser have shown that the function of *B. coli* in the intestine is not inconsiderable, if only because of its possible antagonism to certain putrefactive bacteria.

The slowing up of peristalsis may be a chronic condition due to sedentary occupations and lack of exercise, with a tendency to flatulence and distention; or it may be that trauma or accident has suddenly imposed inactivity upon an active person used to laborious work, and this inactivity has led to intestinal stasis, although the trauma did not directly involve the part to which pain is referred.

It is not my purpose here to discuss the chemistry of the condition, nor to draw direct conclusions from the laboratory findings as to the factors underlying myofascitis; but these merit the continued interest and further research of clinicians and laboratory investigators. Suffice it to say that the laboratory work on the feces confirmed the opinion that toxic absorption in the colon was the important factor in producing the clinical picture.

We have long known that absorption

from an infected tooth may produce marked symptoms at various joints. Indeed, symptoms have been known to subside within forty-eight hours after the removal of such teeth. Yet, if we consider the possible areas for absorption in the body, the colon certainly offers one of far greater extent—approximately 500 square inches. The fact that the surface is not smooth, but is filled with diverticula and haustra, which by harboring inspissated feces court infection, is also significant.

The peculiar settling of the toxins in the fascial insertions may be partly due to diminished circulation in a large number of terminal capillaries in these locations.

#### CLINICAL FINDINGS

The local manifestations of subacute or chronic myofascitis are usually orthopedic in nature, and are rarely seen by medical men except in very acute cases. The inflammatory or toxic involvement is usually low grade. Indeed it is surprising that from an ordinary clinical examination more cannot be found in the way of edema or exudate as evidenced by the increase of diameters, which is rarely noted. Occasionally in a very muscular individual the hamstring muscles in severe cases have been found to be extremely sensitive to palpation, and with a series of swellings or so-called "knots" extending from the tuberosity of the ischium to the popliteal space, necessitating constant recumbency. These cases are, however, in the minority. Such an acute manifestation may be seen by the physician rather than the surgeon; but as things go on and symptoms persist, the patient comes to the orthopedist. Probably this is why many medical men do not have a clear understanding of myofascitis, because they see only the acute stage, and do not have an opportunity to follow cases during the later orthopedic manifestations.

By all means the most frequent location of pain is the lower back, where there are so many fascial insertions into bone. It may be vague or definite, and related to the spine, sacrum, or posterior wing of the

ilium. Other myofascial insertions may be sensitive to touch or tension, as the patella, the point at which the tendo Achillis is attached to the os calcis, and also at the epicondyles of the humerus. Difficulty in completely immobilizing the lumbar spine and preventing pull upon the fascial insertions and muscles accounts for the very troublesome and persistent symptoms in this region.

Certain patients complained of pain in the region of the sacroiliac joint, and had been treated for relaxation of this joint. The diagnosis had been considered confirmed because immobilization, such as strapping, or application of a belt or cast, afforded temporary relief. But recurrence of pain developed in connection with a return of focal infection or gastrointestinal disturbance. A few cases had even been referred for operation.

In practically every such case of low back pain, flexion of the hip, followed by extension of the knee, caused tension and resultant acute pain at the insertion of the fasciae and muscles into the bony structures in the region of the sacroiliac joint. I have called this the myofascitis sign. These structures are at the crossroads of the trunk and thighs; they are pulled upon by the most powerful muscles in the body, and are on more or less tension most of the time. Slight toxic irritation or inflammation will therefore cause considerable pain and discomfort.

Although in cases of low back pain, the latter may seem to be in the sacroiliac joint, upon more careful study it is usually found to be more widely distributed in the surrounding structures. "Sacroiliac strain," a diagnosis formerly made not infrequently by myself, and still frequently made by others, I find, produces symptoms that are widely distributed outside this joint, a fact which is not consistent with actual joint strain. Although from palpation alone it is practically impossible, because of the anatomic position of the joint beneath the posterior wing of the ilium and the deep overlying structures, to be

certain whether the pain is from pressure on the joint itself or on the fascial insertions of muscles into the surrounding bony structures, a careful analysis of symptoms leads one to the latter conclusion, and the results of treatment based upon this conclusion support it more definitely than any theoretical considerations. If there is sensitiveness to deep pressure over the fasciae or muscles in the region of the posterior superior spine of the ilium, posterior surface of the sacrum, over the gluteal fascia, and along the fascia lata on the outer aspect of the thigh, the case is one of myofascitis, and not sacroiliac strain. In certain instances this sensitiveness extends from the outer side of the leg to the region of the external malleolus.

From repeated examination I feel that true sciatica is also extremely rare, and that many cases clinically called sciatica are myofascitis. The wide distribution of sensitive areas noted on palpation is not in accordance with the location of the nerve trunk and its branches, but rather with that of the fasciae. As in the case of sacroiliac strain, the most sensitive areas are found to be at or near fascial insertions to bone.

Histories in these cases, if taken carefully, frequently reveal other evidences of toxic absorption, such as remote or intermittent headaches, vague attacks of pain, a crick in the neck, or treatment for lumbago on one or several occasions. These attacks have been associated with or have followed some slight exertion, such as lifting a pail of water or a brief case, or swinging a golf stick. The pains have shifted from one region to another, depending on what was the exciting factor.

Particularly in accident cases I observed that patients complained of vague pains at sites of presumed injury, although no actual injury was found on close examination. Careful examination and history revealed that the patient had for some time been a victim of toxic absorption from the colon, and that the muscles and fasciae were so affected by this toxicity that comparatively slight injury had produced symp-

toms out of all proportion to the degree of trauma.

In these days of the reactions of the Workmen's Compensation Law with the resultant so-called "compensitis" (the human tendency to lie back when pay is received without work, an unfortunate psychological and physical reaction retarding convalescence in certain types of patients), many cases come to the orthopedic surgeon two or three years after an acute attack of pain has occurred following ordinary exertion. The insurance company has been paying compensation during all this period. The patient still dwells on the accident, which is often of so slight a nature that it could not possibly account for a serious injury resulting in chronic incapacity. One such patient, a strong, robust man, lifted a heavy roll of paper, felt pain in the lumbosacral region, and went to bed for five days, then continued unable to work. The company paid for his idleness for two years, after which he was referred to me. Treated for myofascitis, and the toxicity of the colon cleared up, he was readily cured.

#### DIFFERENTIAL DIAGNOSIS

Features in the differential diagnosis are a history of former manifestations of toxic absorption, such as headaches, crick in the neck and lumbago, and usually some evidence of a focus of infection or origin of toxic absorption, such as an infected tooth or tonsil, or colitis. These may be revealed by x-ray findings, physical or laboratory examination. The most diagnostic sign of myofascitis is pain at bony insertions elicited by tension on the involved muscle or fascia, brought about in examination by limb posture, such as forcibly flexing the hip while the knee is extended. For instance, myofascitis in the lumbosacral region results in pain in the region of the sacroiliac joint, because of tension upon fascial and muscular insertions over or directly around it. Adhesive strapping as usually carried out for sacroiliac relaxation or strain may relieve pain because the immo-

bilization relieves these sensitive insertions from the tension of muscle pull or postural change.

#### TREATMENT

If a focus of infection other than the colon has been demonstrated, such as apical abscesses or tonsils, the treatment is apparent and need not be discussed in this paper. But for the remaining 90 per cent of cases in which the toxic absorption is from the colon, surgical eradication is certainly not to be advised lightly, and the following treatment renders it, in a very large percentage of cases, unnecessary.

It also markedly diminishes the duration of mechanical treatment for the local orthopedic manifestations, and in some cases, seen early, eliminates mechanical treatment entirely.

The colon is treated with medicated lavage; *B. coli* implantations are made; and a low-residue diet is prescribed which prevents carbohydrates from reaching the colon in undigested form, as their presence is known to favor toxic conditions. As Finker and von Wassermann believe that autointoxication is the result of bacterial activity on certain sugars, elimination of the offending sugar from the diet may be beneficial. Laboratory examination of the stool will reveal which sugar is the most active bacteriologically for a given patient, and this sugar should be eliminated from his diet.

To forestall any possibility of residue protein reaching the colon undigested, or bringing with it partially digested carbohydrates and liberating them in the colon, proteins and meats are taken only in moderate quantities, and the importance of thorough mastication is impressed on the patient. The work of Kellogg at the Battle Creek Sanatorium has taught us much regarding the relation of diet and the action of the colon, and the influence of the colon upon health.

To help to restore the alkaline balance, 15 grains each of calcined magnesia and calcium lactate are given in water after

eating, three times daily. Milk of magnesia powders are also given as necessary to relieve constipation.

The medicated colonic lavage is given daily by the following technique, which is very important: the patient is placed upon the left side with the buttock elevated on two pillows. The reservoir (holding two quarts) is elevated not more than eighteen inches above the patient, in order that peristalsis may not be unduly stimulated and an involuntary effort to expulsion of the fluid thus interfere with the treatment. A short glass rectal tip is used. A low enema of a pint of lukewarm water is first given to clear out all feces from the extreme lower portion of the colon. After this has been fully expelled, a second lavage consisting of 2 dr. of calcium lactate in 2 qts. of warm water is allowed to flow slowly in; this will usually take about ten minutes. With the buttock still elevated, the patient then lies upon his back, with the thighs extended, for a period of two or three minutes, then on the right side with the buttocks still elevated for an additional two or three minutes, to permit the solution to flow as much as possible into the ascending colon and cecum. He is then allowed to expel all this fluid. This expulsion will be hastened by walking a little, and will consume from ten to fifteen minutes.

The patient then takes the same position on the treatment table as before, and 1 dr. of sodium carbonate monohydrated, dissolved in 2 qts. of lukewarm water is allowed to flow into the colon in precisely the same manner as the calcium lactate solution, but is retained a few minutes longer than the previous lavage. The treatment should be continued daily until the last fluid comes away without much mucus.

The case is then ready for colon bacilli implantations. Some cases will do well without them, and the implantations are therefore not given routinely; but it has been found that in most cases their action contributes definitely to the relief of

symptoms. The cultures should be obtained fresh from the laboratory and used within four hours.

*Local mechanical treatment* in the form of belts, corsets, braces, etc., is applied when indicated, but the treatment just outlined alleviates local symptoms to such an extent that the need for local treatment is surprisingly diminished, and is entirely secondary.

Stretching of the lumbosacral region, as carried out for cases of so-called sacroiliac strain, often helps to give relief in chronic cases of this kind, the theory being that muscular and fascial adhesions are ruptured and ironed out. This explanation is offered as accounting for relief brought about in many instances by chiropractors by their manipulations on various parts of the body.

TABLE I  
VARIETY OF PREVIOUS DIAGNOSES AND TREATMENT IN  
CASES OF MYOFASCITIS

Previous diagnosis	Previous treatment (without relief)
Lumbago.....	Massage, baking, electrotherapy, osteopathy, chiropractic, salicylates, atophan
Sacroiliac strain or relaxation.	Casts, stretching, manipulation, open operation
Sciatica.....	Injections into nerves, stretching, salicylates
Arthritis.....	Open operation, electricity, salicylates, thymus
Strain of lumbar muscles.....	Casts, internal medicine
Rheumatism.....	Internal medicine, baking
Tennis elbow.....	Palliatives
Myositis.....	Salicylates, massage
Intestinal ptosis.....	Typhoid inoculations, ointment
Contusion.....	Strapping, massage, baking
Pelvic twist.....	Palliatives
Knee-twist.....	Bandage and ointments
Flat feet.....	Plates

*Diet.* As has already been indicated, careful attention is given to the diet, eliminating whatever sugar is found by examination of the feces to be particularly active bacteriologically for the patient, and restricting proteins and meats to moderate

quantities, with attention to thorough mastication.

## RESULTS

Striking has been the relief of symptoms when the colonic function has been returned to normal in cases that have persistently resisted mechanical treatment. Patients who have adhered to the above régime have been entirely relieved of symptoms that were in many instances chronic, and have discarded immobilization apparatus in cases in which this had previously been worn. The only recurrences have been in cases in which the colonic function was again allowed to become deranged, and these have usually responded promptly to treatment.

It has been found most advantageous to have the entire treatment, as outlined, carried out under the direction of the orthopedic surgeon, as the colonic condition and the orthopedic manifestations are so closely interrelated, and as the symptoms are orthopedic in nature.

Certain cases of persistent tennis elbow, treated constitutionally by removal of toxic absorption, particularly from the colon, and locally by deep massage, improved rapidly. Local treatment alone in these cases had been slow and unsatisfactory, or entirely unsuccessful. Other orthopedic conditions, such as certain cases of weak- or flat-foot, have likewise definitely improved only after relief of the toxic etiologic factor.

I have found many cases of so-called sacroiliac strain to be in reality myofascitis (Table III), and I shall discuss this point in more detail after reporting a few illustrative cases.

In addition to the 142 cases on which this paper is based, I have seen over 100 in consultation in which the diagnosis of myofascitis was made. As the latter cases were referred back to the attending physician for treatment, I have not included them in this preliminary report. Other cases have not been under my observation long enough to rate the results. The require-

TABLE II

DEGREE OF IMPROVEMENT IN 40 ILLUSTRATIVE CASES OF MYOFASCITIS TREATED BY MEDICATED COLONIC LAVAGE, CULTURES, AND DIET

Case	Complications	No. of B. coli cultures	No. of colonic irrigations	Total time for both	End-result
I	Flat feet	10	7	24 days	Excellent
II	Infected tooth	10	7	20 days	Excellent
III	None	16	7	36 days	Excellent
IV	None	5	10	45 days	Excellent
V	Osteoarthritis	10	10	25 days	Good
VI	None	10	10	30 days	Excellent
VII	None	10	20	37 days	Good
VIII	None	2	14	15 days	Good
IX	None	4	7	14 days	Excellent
X	None	9	7	30 days	Good
XI	None	10	10	30 days	Excellent
XII	Bunions and flat feet	none	4	6 days	Excellent
XIII	None	10	6	33 days	Excellent
XIV	Flat feet	10	7	23 days	Excellent
XV	None	10	7	32 days	Excellent
XVI	None	10	10	21 days	Good
XVII	None	10	20	3 months	Good
XVIII	Arthritis (?)	8	7	67 days	Good
XIX	Flat feet	13	8	30 days	Good
XX	None	12	7	27 days	Fair*
XXI	None	12	10	11 months	Good
XXII	Weak feet	10	10	3 months	Excellent
XXIII	None	3	7	12 days	Excellent
XXIV	Flat feet	10	7	32 days	Good
XXV	None	10	10	35 days	Good
XXVI	None	10	5	28 days	Excellent
XXVII	None	16	7	3 months	Good
XXVIII	Flat feet	5	7	2 weeks	Fair*
XXIX	Loose semilunar cartilage; flat feet	9	7	18 days	Excellent
XXX	Spina bifida	10	15	2 months	Excellent
XXXI	None	10	7	1 month	Good
XXXII	None	10	13	20 days	Excellent
XXXIII	None	8	8	3 weeks	Good
XXXIV	Metatarsalgia	7	8	2 weeks	Good
XXXV	Flat feet	11	7	4 weeks	Excellent
XXXVI	Weak left foot	0	4	3 weeks	Good
XXXVII	Weak feet and metatarsalgia	0	5	1 week	Improved (treatment just begun)
XXXVIII	Flat feet	2	12	3 months	Excellent
XXXIX	Sacroiliac strain	13	22	6 months	Excellent
XL	Referred for operation	12	10	(Marked improvement after 4 treatments) 5 weeks	Excellent

\* Careless of diet; not faithful to treatment.

ments of diagnosis have, however, been met in more than 250 cases.

## ILLUSTRATIVE CASES

CASE 1. Typical acute case. A hard-working man, aged 48, who had been an athlete at college, had gained weight soon after starting in business. His work necessitated considerable

standing, and he had developed pronounced flat feet, which were very painful. A week before the patient was seen by me, he had been much overworked, and had a general pharyngitis. From the posterior pharyngeal wall, which was slightly edematous, there was secured a pure culture of *Streptococcus hemolyticus*. This pharyngitis was immediately followed by sudden and severe pain in the left lumbar region,

loin, and upper posterior part of the thigh, for relief of which he consulted me.

*Gastrointestinal history.* For about five years the patient had had much stomach trouble, evidenced by pain coming on about two hours after meals, and relieved by large doses of bicarbonate of soda. This was also associated with constipation and flatulent stools.

*Examination.* There was extreme sensitiveness over the posterior part of the thigh, which upon casual examination would certainly have been considered due to pressure upon the sciatic trunk. But more careful questioning and examination revealed the fact that the pain was over the fascia of the posterior outer side of the thigh, radiating to the outer side below the knee, and reaching almost to the ankle. With the patient in the dorsal position upon the examining table, with the knee extended, any attempt to flex the hip was associated with complaint of severe pain in the lumbar and posterior thigh region. With the patient on the right side an attempt to adduct the left leg was associated with pain in the outer posterior part of the upper thigh, apparently due to tension on the fasciae.

In the past history of this case, following excessive use of the hammer in driving heavy nails (work to which the individual was entirely unaccustomed), marked sensitiveness had developed over the external epicondyle of the right humerus which the patient localized as the exact location of the ordinary tennis elbow. This had taken three months to subside.

Laboratory tests, roentgenograms of the teeth, examination of the tonsils by a nose and throat specialist, and examination of the prostate, urine and blood chemistry failed to reveal anything abnormal.

*Stool Examination.* Histamin 4 (scale of 1 to 5). Acid to all indicators. This accounted for the toxic absorption resulting in myofascitis.

The patient was given medicated colonic lavage daily for twelve days, and his diet was regulated. The acute symptoms subsided. At the end of four weeks he was able to resume work, but was instructed to continue the diet. At the end of two years he is still free from myofascitis. An acute case such as this, however, is not often seen at this stage by the orthopedic surgeon but usually comes to the medical practitioner.

CASE II. H. F. was seen in my office Dec. 8, 1925. His chief complaint was pain in both

feet, worse when bearing weight, as in walking. The pain had started suddenly in the balls of the feet six months before, and had persisted, gradually increasing. He had "gas on the stomach," but was not constipated. Previous treatment had included medication by mouth, strapping, plates, proper shoes, rest and exercise. Two teeth had been extracted, one of which proved badly diseased.

*Examination.* Pain in the muscles of the calf on dorsiflexion of the foot; flat feet. Roentgen-ray examination showed moderate enlargement and spur formation at the os calcis. Blood examination, negative.

*Stool Examination.* Marked acidity. Histamin, 5+. Oxalic acid present.

*Treatment.* His diet was regulated in accordance with the laboratory findings. Seven colonic treatments and 10 cultures were given between December 14, 1925 and January 8, 1926. The feet were strapped, and fitted to plates, and pads placed under the heel. Medication by mouth. The patient returned to the office June 15, 1926, absolutely cured.

*Comment.* In this case, the toxic condition of a muscle was the direct cause of the muscle spasm. By first offsetting the acid condition of the colon and then applying properly fitted plates, a complete cure was attained.

CASE III. An interesting case is of a man of forty-five. He suffered pain most of the time in the right sacroiliac region and down the right leg. The family physician had treated him for sciatic rheumatism, with baking and electric treatments. The pain was worse at night, but even in the daytime was so severe as to render walking most difficult. Fifteen years before, he had had lumbago. He had no headaches, fever, or spasms.

In addition to the baking and electric treatments, he had received medication, and had worn a corset brace. His condition progressed, and seemed so serious that an able orthopedic surgeon referred him to me for a sacroiliac fusion.

When the patient came in he was apparently very ill, but I did not believe that operation was justified. I made a diagnosis of myofascitis, and instituted treatment accordingly. Following the second colonic irrigation marked improvement was noted. One month later the patient made the statement that he felt well. Two months later there was slight tenderness over the external epicondyle on the right arm,



also of the left subdeltoid bursa. The medicated colonic lavage was therefore resumed, and the diet continued. When last seen, in October, 1926, the patient was having only slight and occasional pain.

*Comment.* Although this case presented no symptoms referable to the gastrointestinal tract, treatment directed to the colon as a focus of toxie absorption proved very effective, and showed that operation would have been unwarranted.

**CASE IV.** A woman, 32 years of age, walked with a cane and complained of pain in the left lumbar region, radiating to the left leg at times, and aggravated by turning in bed. About one year before, she had experienced pain in the left calf, radiating up the left leg. She had been treated elsewhere by baking, strapping, and extraction of teeth.

Dorsiflexion of the left foot produced marked pain in the calf, in the left popliteal space. The stool contained large quantities of histamin and mucus, and was highly acid.

A diagnosis of myofascitis was made, and following the third treatment she stated that she "danced all night" without ill-effect. After seven colonic irrigations and ten implantations, she considered herself cured.

**CASE V.** Recently, in Florida, I was called in consultation on a case that had come under the care of much orthopedic talent, apparently always with the diagnosis of sacroiliac strain or relaxation, and repeated unsuccessful treatment. It is such a typical case of myofascitis that it seems wise to recite it in detail.

Mrs. C. E. D., a middle-aged woman, had had her first attack of "left sacroiliac strain" ten years ago, followed by the usual orthopedic brace treatment. Later, under an anesthetic in one of the large eastern orthopedic clinics, stretching as practised for this complaint was done by a prominent orthopedic surgeon. A Knight brace was then applied, and worn for several months. The trouble recurred, and the stretching was repeated by the same surgeon in 1921. In 1924 a nerve in the lumbosacral region was injected with saline solution. As the relief lasted only about forty-eight hours, two days afterwards stretching under a general anesthetic was again done. This afforded relief, but the symptoms recurred in January, 1925. Stretching was then repeated by the same surgeon who had treated the patient in 1916 and in 1921. Afterwards a Spencer corset brace

was applied. Tonsils and several teeth had been removed several years before my examination.

Shortly before I saw her, the patient was in an automobile accident and sustained multiple bruises, more particularly a scalp wound. She went to bed and was very nervous, but had no symptoms of her old, so-called "sacroiliac relaxation" until three days after the accident. She then complained of pain in the left lumbosacral region, extending down the thigh and outer surface of the leg to the region of the ankle. When I examined her, she was in bed, lying with the lumbosacral region upon an electric pad which she said had always given her relief. She further stated that she was feeling wretched all over, so much so that she was in bed as much for her general condition as for the condition in the lumbosacral region and thigh.

*Examination.* Deep palpation elicited sensitiveness over the posterior part of the sacrum on the left side. Turning in bed caused pain. The patient could lie more comfortably on the right side. Mesially to the posterior superior spine of the ilium there was sensitiveness to pressure over the outer surface of the thigh, and this extended to just above the ankle. This sensitiveness was over the fascia lata and muscles underlying. Deep pressure over the sciatic trunk failed to evoke any sensitiveness. The knee jerks were normal; there was no ankle-klonus and no phenomenon; flexion of the hips with the knees flexed was normal, but flexion of the right hip with the knee extended caused pain in the lumbosacral region when reaching the right angle. On the left side, the same test produced more severe pain before reaching a right angle, and the pain was referred from the lumbosacral region along the posterior part of the thigh.

Questioning elicited the fact that the patient had long been subject to headaches, malaise, and constipation.

Shock had disturbed this patient's gastrointestinal metabolism, which was already faulty. For purposes of discussion, let us grant the diagnosis, made elsewhere, of sacroiliac strain. How can one explain the general symptoms of feeling wretched all over (which could not be attributed directly to the accident, as they had accompanied previous attacks), and the wide distribution of the findings, extending from the posterior part of the sacrum nearly to the ankle on the left side, and the pain upon stretching of the muscles and fascia of the right side when the hip was flexed and the knee

extended? What relationship could there be between the sacroiliac joint on the left side and these complaints?

If, however, we grant the diagnosis of myofascitis, of colonic origin, the entire symptom-complex is easily explained, as well as the past history. The stretching under an anesthetic in such cases often gives relief, temporarily, for the simple reason that the adhesions coincident with the toxicity of fasciae and muscle insertions are stretched or broken down, and the formerly toxic muscles are stretched and ironed out. The general malaise or wretched feeling of the patient could not be explained by any other hypothesis, especially since it had been associated with all former attacks. The generalized symptoms occurred in both extremities and extended on the left side from the lumbosacral region to the lower leg.

I prescribed treatment directed against the toxicity of the colon, as previously outlined, and the case has done unusually well.

#### SACROILIAC STRAIN AND RELAXATION

At the present time a very large number of cases are diagnosed as "sacroiliac strain or relaxation," and treatment of great variety is instituted for them. This includes strapping, belts and braces, massage, casts, and even sacroiliac fusion. In the light of the observations recorded in this paper, I believe that in many instances the condition is really myofascitis of toxic origin. Symphysiotomy, pubiotomy, fracture of the pelvic girdle, all necessarily strain or separate the sacroiliac joint to a far greater degree than could possibly result from the trifling injuries that are considered competent to produce sacroiliac strain, yet in my experience with a large number of such cases, symptoms referred to the sacroiliac region are notably lacking.

The purpose of mentioning the above cases is not an attempt to prove that sacroiliac relaxation or strain never exists, but to build up an argument that too much significance has been given to this train of thought with a consequent and unfortunate submerging of the toxic conception.

It should be realized that it is most difficult to bring pressure to bear upon the

sacroiliac joint because of its lying beneath the posterior wing of the ilium, which shelves over it to a considerable degree toward the mesial side of the joint. Moreover, the posterior ligament and capsule of the sacroiliac joint are extremely thick and held in more or less tension between its insertion on the posterior wing of the ilium and sacrum.

The old saying that the "proof of the pudding is in the eating" is a forceful argument in this instance. By this I mean that since recognizing the clinical entity, myofascitis, and establishing a rational treatment for it, numerous sacroiliac braces and corsets have been found unnecessary, the patients being either completely relieved of their "sacroiliac symptoms" by the elimination of toxic absorption, or so considerably improved that they would not consider resuming the braces (Table III).

TABLE III  
PERSISTENT CASES OF "SACROILIAC STRAIN" RELIEVED  
FOLLOWING TREATMENT FOR MYOFASCITIS

Case	Previous diagnosis	Previous treatment	Result of previous treatment	Result of treatment for myofascitis
I	Sacroiliac strain	Corset brace; baking; electric treatment; medication	Condition progressing; referred to author for operation	Excellent Brace discarded No operation
II	Sacroiliac strain	Strapping; baking; massage; circular cast; Taylor brace; double spica	Unrelieved	Excellent Brace discarded
III	Sacroiliac strain	X-rays; corset brace; sacroiliac belt	Slight relief	Excellent Belt and brace discarded
IV	Sacroiliac strain	Sacroiliac belt; medicine; osteopathy; baking; operation considered	Unrelieved	Excellent Brace discarded
V	Sacroiliac strain	Brace	Unrelieved	Good Brace discarded
VI	Sacroiliac strain	Corset brace; plates	Unrelieved	Excellent Brace discarded

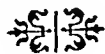
If the toxic case is very severe, relief of tension upon the insertions of fasciae and

muscles can be quickly brought about during the early stages of the colonic treatment by strapping with adhesive plaster, precisely as has been carried out in the past for so-called sacroiliac relaxations, and this is recommended. The important point is that this is merely *temporary palliative treatment*, and becomes quite unnecessary as soon as the *primary colonic treatment* takes effect; whereas strapping instituted as the sole means of treatment is either entirely ineffective, or at best temporarily palliative.

The fact that stretching under an anesthetic has given permanent or temporary relief in cases of myofascitis erroneously diagnosed as sacroiliac strain has led to a

misinterpretation on the part of the attending surgeon that the stretchings had relieved the symptoms because of the mechanical readjustment of the sacroiliac joint. (See Case v.) In the light of my observations it is evident that this is not the cause of relief. Rather, manipulation has stretched sensitive fascial structures formerly toxic, and thus relieved the symptoms until the toxic condition recurred.

Working on the premise of myofascitis attendant upon toxic absorption, it is surprising how consistently many baffling cases work out, and are cured, particularly those of low back pain.



## ILEUS

The forward march of operative technique has been so astounding and so rapid that our perspective of what surgery really is has been thrown out of alignment; and our judgment of what it can in truth perform has become somewhat biased. It can do and has done so much that it has rather been expected to do all. On analysis surgery is of the mechanical *mechanical*, and its lasting kingdom can only be in those realms of disease which have an origin fundamentally mechanic. It is true that the cause of acute obstruction is of this nature, but the cause of ileus is not, since this can and does appear in peritonitis, in uremia, and in other pathological states devoid of any mechanical interference with the proper working of physiological processes. Organic obstruction is one thing which must ever be submitted to manual repair, but ileus is always ilcus; it is always paralytic in nature, and has a much more

fundamental basis of being, and in its cure surgery can, I believe, have no real part. It is for this reason that enterostomy, enteroanastomosis, jejunostomy, and the like procedures have so signally failed us in our efforts to cope with this condition. From a realization of this impotence there goes up the cry for earlier diagnosis as the only means of escape. From the viewpoint of scientific advancement it is a cry of despairing ignorance, but from that of clinical surgery it is truth; for instrumental methods will never be able to do more than put right the mechanical upset before the serious onset of ilcus. Also, however early the diagnosis may be made in cases of organic obstruction, there will yet remain the paralytic ileus of metabolic origin, still as deadly as ever and still as misunderstood.—R. ST. LEGER BROCKMAN in *Lancet*.

# LOW BACK SPRAIN

## THE SACROILIAC SYNDROME\*

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**D**ISABILITY due to pain in the lower back is being drawn to our attention more and more frequently. We see especially the type with involvement of the sacroiliac joint and of traumatic origin. Interest in the latter cases has undoubtedly been stimulated by their frequent appearance at Compensation Commission hearings. Even a casual survey of the literature on sacroiliac disease in the past five years reveals that it is becoming more and more recognized as a distinct syndrome. We shall here consider only the traumatic and relaxed types of sacroiliac syndromes.

Many etiological factors enter into these low back disabilities, varying from static strain on the ligaments due to constant standing with muscles of the back relaxed, as with many young women, producing the sacroiliac relaxation described by Baer, to the violent attempts to lift heavy weights, producing the severe sacroiliac subluxations or arthritis and back strains of a different type. They vary from falls to obstetric labors. Many patients awake from an anesthetic to complain bitterly of pain in the lower back after lying on a flat table a protracted time. The number of wrenched backs occurring in wrestling, football and in the industries is legion.

Before anything can be said concerning sacroiliac subluxation or arthritis or syndrome, call it what you will, essential points in anatomy must be brought out for a clearer understanding of the mechanics of the disturbance. We are concerned here with a true diarthrodial joint (Figs. 1 and 2), in which the opposing surfaces are partly in contact but, in the main, are separated by synovial fluid. This has been

brought out by Goldthwait, Albee, Roberts of England and others. As the sacrum is broader in front than behind and above than below, the joint surface faces backward, outward and downward and is completely covered by the overhanging posterior superior spine of the ilium. The joint surfaces mesh like two oyster shells placed one within the other; especially is this so in the male. They are covered with cartilage, thicker on the sacral than on the iliac side.

The capsule of the synovial cavity is formed by the surrounding ligaments. Of these the most important structure, for it receives all the weight of the erect body above the pelvis, is the posterior sacroiliac ligament. It not only is the suspensory ligament of the body but the pivot ligament of the sacroiliac joint itself. It plays an important rôle in the mechanics of subluxation. It arises from the posterior superior spine of the ilium and runs forward to the sacrum, fanning out and filling in the notch formed by the overhanging posterior superior spine of the ilium and the body of the sacrum. This ligament, especially the horizontal and main segment, forms one of the strongest fiber masses in the body. No amount of force has been able to tear it without fracturing the bony structures of its insertions. The upper part of the sacrum is, therefore, absolutely prevented from moving forward.

Two other ligaments have an important bearing on the mechanism of sacroiliac syndrome. They are the greater and lesser sacrosclatic ligaments. The former is attached by a broad base to the posterior inferior spine of the ilium, to the fourth and fifth transverse tubercles of the sacrum,

\* From the Hospital for Joint Diseases.

to the lower part of the lateral margin of that bone and the coccyx; its fibers converge to the inner margin of the tuberosity of the ischium and are prolonged forward along its ramus. The latter is a triangular ligament attached by its base to the lateral margin of the sacrum and coccyx and the attachment of the great sacrosciatic ligament; its apex is inserted into the spine of the ischium.

The muscles mainly involved in the disturbance are the gluteus maximus and

the biceps into the head of the fibula, some tendinous bands passing to the outer tuberosity of the tibia; the semitendinosus into the inner tuberosity of the tibia; and the semimembranosus into the inner surface of the inner tuberosity of the tibia, with expansions to reinforce the posterior surface of the knee joint capsule. These muscles, plus the erector muscles of the back acting against the upper body weight, form the motive power to produce subluxation.

What happens when a traumatic sub-

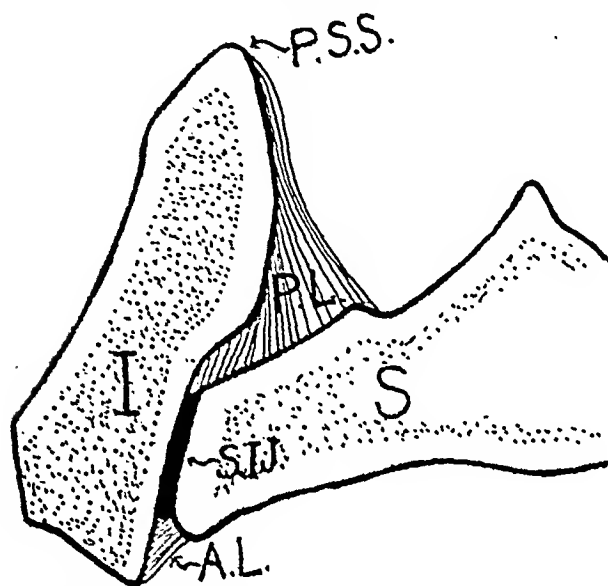


FIG. 1. Coronal section through the ilium, i., sacrum, s., and sacroiliac joint at the posterior superior spine of the ilium. P.S.S., showing the heavy posterior sacroiliac ligament, P.L., and the smaller anterior sacroiliac ligament, A.L. The joint is represented by the black surface between them, S.I.J. (Piersol's Anatomy.)

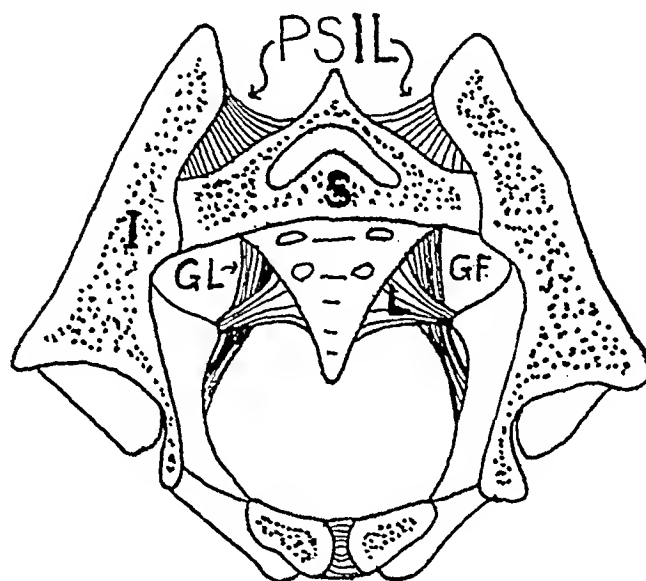


FIG. 2. Coronal section through the pelvis, i., ilium, s., sacrum, G.L., great sacrosciatic ligament, L., lesser sacrosciatic ligament, G.F., great sacrosciatic foramen. (Piersol's Anatomy.)

the hamstrings. The former arises from the lateral surface of the posterior part of the ilium behind the superior gluteal line, from the posterior surfaces of the sacrum, coccyx, sacroiliac and great sacrosciatic ligaments. The muscle fibers pass to the femur over its great trochanter and the tuberosity of the ischium, to be inserted into the iliotibial band of the fascia lata and into the gluteal tuberosity of the femur. The hamstrings, consisting of the biceps, semitendinosus, and semimembranosus, all arise from the tuberosity of the ischium (with the exception of the short head of the biceps, which does not interest us as it arises from the femur), and are inserted:

luxation of the sacroiliac joint is produced? In explaining the mechanism it was stated that in suddenly lifting a weight there results a rupture of some of the ligaments in the back, which gives rise to the "stitch" complained of, and subluxation of the sacroiliac joints results from the weakening of the ligaments (Goldthwait). Many observers looked for a rupture of these ligaments. Bradford and Lovett found none and consequently denied the existence of the sacroiliac syndrome. Roberts found none and so looked elsewhere to explain the symptoms. He believed the lesion to be a gluteal myositis and operated for this condition. Moorhead, and also Lewy of the New York Industrial Commission, said that patients have come under their

observation with very severe fractures of the pelvis and no ligaments were found torn even when the injuries proved fatal. These ligaments could not be ruptured on the cadaver. They all discounted the presence of a subluxation because of the absence of a pathological condition. Actually no tear of the posterior ligaments of the joint ever occurs.

The sacrum can rotate on a horizontal axis through its second segment. When the upper part moves backward the coccyx

horizontal part of the posterior ligament causes the upper part of the sacrum to move backward (Fig. 4). The back cannot return to its normal lordosis and the man is unable to rise, often falling to the ground. Because of shearing a true synovitis results. The muscles of the back become taut trying to produce a lordosis. With the back flat, the hamstrings reflexly become spastic. The action of these muscles is the same as those in any dislocation, as of the jaw, where the masseters and the

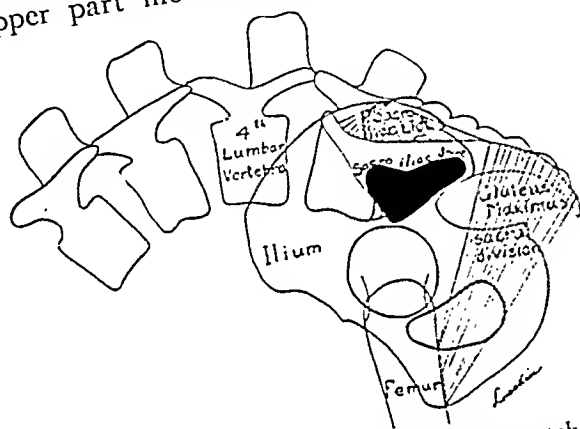


FIG. 3. Transparent diagram of the lumbar vertebrae, sacrum, os innominatum, femur, sacroiliac joint (black area), and the sacral and coccygeal division of the gluteus maximus. It represents the mechanics of subluxation of the sacroiliac joint. The violent pull of the sacral and coccygeal part of the gluteus maximus on the sacrum causes a shearing of the joint surfaces.

moves forward and vice versa. However, the posterior ligament and the two sacro-sciatic ligaments absolutely prevent the top of the sacrum from suddenly moving forward and the coccyx backward.

When the body is bent forward and is starting to lift a weight the back muscles contract, fixing the spine. The iliac part of the gluteus maximus and the hamstrings become taut to fix the pelvis, prevent the body from falling forward, and start the raising of the weight. The only muscle or part of muscle free to act is the sacral and coccygeal part of the gluteus maximus (Fig. 3). This violently pulls the lower part of the sacrum forward, shearing the joint surfaces. The pivot action of the

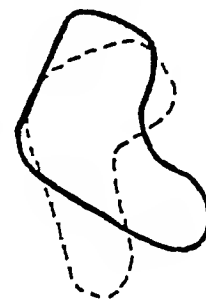


FIG. 4. The excursion of the sacral surface of the sacroiliac joint during subluxation as indicated by the arrows, the curved line representing the body as a lever. The lower portion of the sacral joint surface swings forward, the upper backward.

pterygoids become spastic. They reflexly try to reduce the dislocation. As the result of this condition of the muscles, flexion of the back with the legs straight is impossible. A hamstring spasm sign is present, especially on the affected side. Because of the synovitis the joint is tender.

The shearing of the joint surfaces results in injury to the cartilage with inflammation, exudation and fragmentation, then healing as in cartilage elsewhere; in other words, a true traumatic arthritis ensues. Moorhead, in a personal communication, expresses the belief that the condition is a traumatic synovitis with an effusion into the joint and tearing of the cartilage.

inous covering. The effusion probably contains an excess of fibrin, and organizes. The cartilage, like cartilage elsewhere, not having a blood supply of its own heals with an irregular scar, as with the cauliflower ear of the pugilist, the torn internal semilunar cartilage of the knee, the thickened articular fibrocartilage of the so-called baseball finger. This organization of the exudate and roughened cartilage causes the click often heard in manipulation and is probably the main cause of recurrence of the disability.

In the relaxed type of sacroiliac joints, as the operating etiological factor is different, the mechanism differs from that which takes place in the acute type of cases. Here the body weight is transmitted directly to the ligaments of the sacroiliac joint, because of the complete loss of tone of the supporting muscles. The back becomes quite lordotic; the abdomen protrudes. The ligaments gradually stretch out and the sacrum is allowed to swing from the pivot ligament. The upper part moves forward and the lower backward (Fig. 5). The same shearing takes place here as in the traumatic subluxation but in the opposite direction and more gradually. The injury to the joint surfaces is practically nil except for the stretched ligaments. As there is less interlocking of these surfaces in the female than in the male, this condition occurs more often in the female.

Practically every case of sacroiliac disturbance giving a history of injury shows the same cardinal symptoms and signs, which increase in severity as the condition becomes chronic. Pain in the lower back, most severe over the joint involved, aggravated by walking, sitting, standing or lying flat on the back, is usually the first symptom complained of. Bending or lifting is made difficult because of it. After the condition has existed for a few days the pain radiates down the back of the leg on the affected side, often down to the calf or heel. The body lists away from the injured side, but may occasionally list

toward it. The back is spastic and flat, and the involved joint is tender. The hamstring spasm becomes so severe that extension of the leg on the thigh after flexing

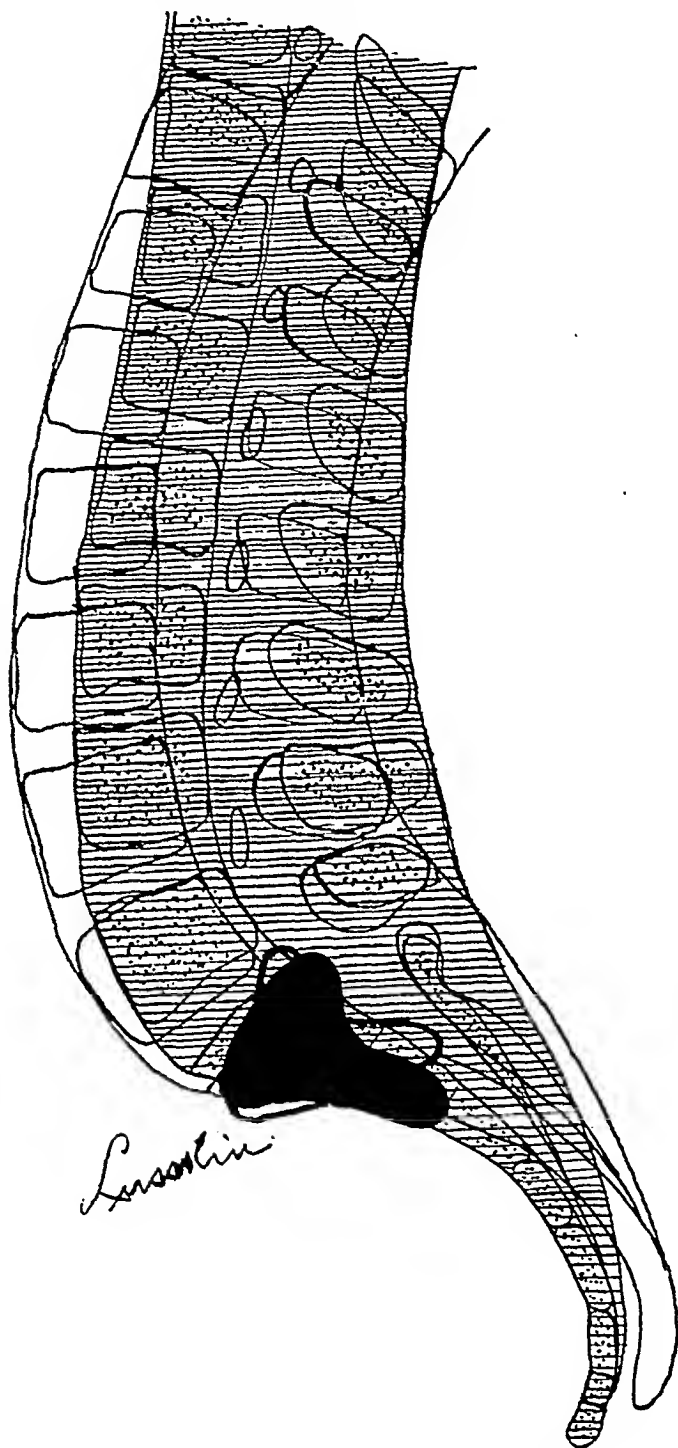


FIG. 5. The excursion of the body from the normal (shaded area) in relaxed sacroiliac joints.

the thigh on the abdomen is impossible without pain being referred to the injured joint. Occasionally the sound side may show the same phenomenon. All patients have aggravated weak feet.



In the relaxed sacroiliac joint the pre-dominating symptom is fatigue of an enduring type. There are dull aches and pains in the lower back radiating up the spine, and marked lordosis. Hamstring spasm is not present; the joints are only slightly tender. The entire general tone of the musculature of the body is far below par. The feet show marked weakness.

Roentgenography is valuable in ruling out other conditions, such as fractures, neoplasms, infections, etc. The sacroiliac

put at rest. Putting the patient to bed is unnecessary and frequently impracticable. Rest for the back may be obtained by a plaster of Paris cast or adhesive strapping. If seen very early, the use of adhesive strapping usually suffices, since, if properly applied, one can obtain results the same as with a plaster of Paris jacket, or better. The method of strapping employed is as follows: 2-in. strips of adhesive plaster are used, overlapping about  $\frac{1}{2}$  in., starting about 2 in. in front of the anterior



FIG. 6. A back strapped with partially overlapping transverse strips of adhesive plaster 2 in. wide and extending from the lower ribs to the great trochanters.

joint cannot be roentgenographed properly. There are too many interfering structures and the joint surfaces are oblique. Possibly someone will perfect a technique of taking a true roentgenogram of the joint by means of a tube of radium in the rectum and a plate placed obliquely over the back of the ilium. Only then shall we be able to see the subluxation, if it exists.

Treatment varies with the case in acute back sprain. The first object is the removal of inflammatory products in the traumatized soft tissues. All motion is painful, as is also the case in acute sacroiliac arthritis, and most often limited. The part should be

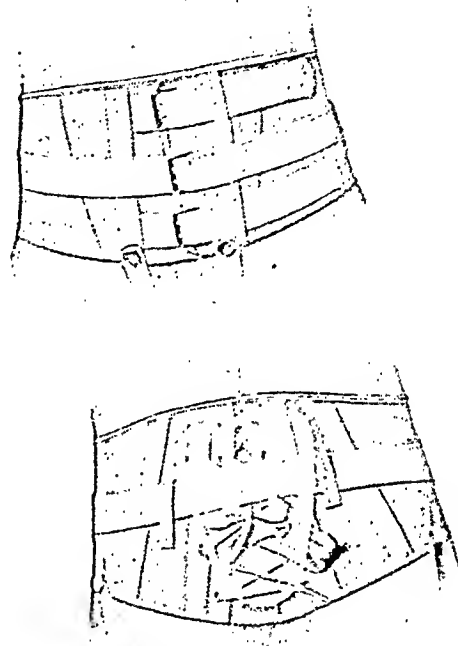


FIG. 7. A canvas non-elastic sacroiliac support with a felt pad in back and perineal bands. The support buckles in front.

superior spine of the ilium, across the back to 2 in. in front of the anterior superior iliac spine of the other side. The first strip is applied midway between the trochanter major of the femur and the anterior superior spine of the ilium. The low position of this strip is very important; it grips the glutei muscles. Succeeding strips are now strapped to the back up to and including the so-called short ribs (Fig. 6). Some men place a triangular piece of felt over the sacrum before applying the adhesive.

This strapping can be supplemented by two strips, 2 in. wide, running under the transverse strips in the form of a letter X, down and across the back from the ribs to the trochanter of the femur, acting as trusses. This adhesive strapping affords immediate relief and should be renewed in about five days.

At the end of two weeks, physical therapy should be commenced, in the form of superheated air, by baking or exposure to heat and light from a high power incandescent lamp. This is followed by stroking massage and exercises. The massage treatments and exercises should be performed very cautiously so as not to overstrain these already weakened muscles. With this form of treatment the average acute cases of back strain or sacroiliac arthritis can return to their occupations in from three to four weeks, if they come under observation very early. The severe types of cases usually require treatment over a period of six weeks or more.

Exercises should be guarded so as not to overstrain the weakened muscles. Pain and fatigue should be avoided. Exercises consist in the moderate performance of the motions of this region, namely, flexion, extension, rotation and lateral bending.

The treatment of the more severe type of sacroiliac arthritis is either supportive alone, reduction and support, or stretching, reduction and support. The mildly acute cases are greatly benefited by strapping with adhesive plaster as described above. The more severe cases require an open plaster of Paris jacket which laces in front, or a closed jacket which is later replaced by an open one. These cases must be under treatment for at least three months. With the presence of marked hamstring spasm the patient will get no relief until he is thoroughly stretched. Under deep anesthesia the hamstrings of each thigh are, alternately, slowly but thoroughly stretched out by flexing the thighs on the abdomen with the knee extended until the muscles are felt to give. This may mean bringing the leg to the patient's head. The patient is

then turned over on the abdomen across two large sandbags or between two tables, and sudden direct pressure is applied over the upper part of the sacrum in an attempt at reduction. With the patient's back in hyperextension a closed jacket or spica is applied from the axilla to the pubes or knee. This is kept on for ten days and then an ordinary open jacket is substituted. This method of treatment in part was introduced by Baer of Johns Hopkins Hospital in 1917. In these severe cases, because of the damage to the joint cartilage, the injury is really a permanent one, so that after the jacket is worn three months a belt or corset has to be worn to avoid recurrence.

Operative procedures for permanent fixation of the sacroiliac joints have been described by Albee, Magnuson, Smith-Peterson and others, with very good results. In cases of repeated recurrences and disability and loss of occupation, it should be given serious consideration.

Sacroiliac arthritis must be differentiated from disease of the lumbar vertebrae, infections locally and elsewhere, fractures and neoplasms. A good history, the absence of roentgenographic findings, negative rectal and vaginal examinations, will rule out other conditions. These, plus the presence of the cardinal signs, will make the diagnosis clear. It is at times obscured, as in those injuries following falls where the spine is also involved. Here the sacroiliac signs are blanketed, but as the spinal symptoms subside the sacroiliac signs will come through. One sign will clearly differentiate a spinal from a sacroiliac arthritis. With the patient in a chair, flexion of the spine is impossible in spinal involvements whether the knees are together or widely separated, but it is relatively easy in sacroiliac arthritis when the knees are separated.

In the detection of malingerers one must be observant for any affected symptoms not associated with the condition. The association of a so-called traumatic hysteria or traumatic neurosis must also be borne in mind. We have found that a good test for

the malingering of pain is to give a hypodermic injection of 0.5 grain of morphine at bedtime. If on arising the patient claims to have had pain, one may conclude one is dealing with a malingerer.

The prognosis in the acute cases, if treatment is commenced early, is good. In the chronic relaxed cases it is often poor, for the disease is long-drawn-out. In the chronic traumatic cases it is fair. Recurrences are numerous. Wearing a belt (Fig. 7) minimizes them to a certain extent but does not preclude them. The open operation cures the condition. A recurring low back sprain is a source of annoyance to the patient and to the physician. Many become sources of revenue for the osteopaths, chiropractors, naturopaths and other cultists.

In every case, a first subluxation makes it easier for a second one to occur. The more severe the injury the easier the recurrence. The early cases will require three months before a cure is obtained, the more severe cases will need support for an indefinite period, although with support they are without discomfort.

Correction of any postural defect or of a weak foot, if present, will aid the prevention of recurrence.

All injuries to the back, no matter how trivial, should be investigated roentgenographically, the roentgenogram to be made in the standing and recumbent positions. All patients should wear a belt to minimize the possibility of recurrence.

In conclusion, sacroiliac subluxation is a definite disease with a definite syndrome and a definite treatment. There are four cardinal signs to be remembered: flat back, scoliosis, tenderness over the involved joint and the hamstring spasm. The treatment

is reduction and support, and if these give no relief, operation.

Note. Since this paper was written, Smith-Peterson's articles on the sacroiliac operation have received wide recognition. Roberts has presented a case at the New York Academy of Medicine, with all the classical signs, in which, at operation, a movable sacrum was found. The patient was completely relieved by the operation. Mayer has operated on several patients with brilliant results, proving that the sacroiliac joint was the offending tissue.

# REFERENCES

- BAER, W. S. Sacroiliac strain. *Johns Hopkins Hosp. Bull.*, 1917, xxviii, 159.
- BERRY, J. McW. A new sacroiliac support. *Surg., Gynec. & Obst.*, 1923, xxxvi, 835.
- COOPERMAN, M. B. The diagnosis and treatment of minor injuries to the lumbar spine and sacroiliac joints. *N. Y. M. J. & M. Rec.*, Feb. 7, 1923, 159.
- COWAN, J. Relation of sciatica to the sacroiliac joint. *Brit. M. J.*, 1923, 1, 372.
- GOLDTHWAIT, J. E., and OSGOOD, R. B. A consideration of the pelvic articulations from an anatomic, pathological and clinical standpoint. *Boston M. & S. J.*, 1905, clii, 593, 634.
- GOLDTHWAIT, J. E. The pelvic articulations: A consideration of their anatomic, physiologic, obstetric and general surgical importance. *J. A. M. A.*, 1907, xlix, 768.
- GOLDTHWAIT, J. E. The lumbo-sacral articulations: An explanation of many cases of lumbago, sciatica and paraplegia. *Boston M. & S. J.*, 1911, 365.
- GOLDTHWAIT, J. E. An anatomic explanation of many of the cases of leg paralysis, as well as many of the cases of weak or painful backs. *Boston M. & S. J.*, 1923, 128.
- MARTIN, E. D. Sacroiliac sprain. *South. M. J.*, 1922, xv, 2, 13, 135.
- PORTER, J. L., and LEWIN, P. A special corset for some back conditions. *J. A. M. A.*, 1924, xxxii, 32.
- ROBERTS, C. S. Some considerations of the sacroiliac joint. *Lancet*, 1923, i, 787.
- SMITH-PETERSON, M. N., and ROGERS, W. A. End-result study of arthrodesis of the sacroiliac joint for arthritis: traumatic and non-traumatic. *J. Bone & Joint Surg.*, 1926, viii, 1, 118.
- WENTWORTH, E. I. Systematic diagnosis in backache. *J. Bone & Joint Surg.*, 1926, viii, 137.

# DILATATION OF THE URETER IN THE MALE

## AUTOPSY FINDINGS\*

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**D**ILATATION of the ureter was first described by Cruveilhier,<sup>1</sup> who found it in women who died in the latter months of pregnancy or just after delivery. Desgranges,<sup>2</sup> in 1822, described hydroureterosis of large dimension due to a valve, formed by plication of the mucous membrane at a point at which the ureter is bent upon itself. In 1876, Henry Morris<sup>3</sup> collected and tabulated 47 cases of hydronephrosis in which abdominal tumor had been caused by the renal distension. In several instances the cause of the nephrectasis was not ascertained, but in 26 cases the obstruction was found situated in the ureter, and in 5 others calculus was present in the renal pelvis.

Structure of the ureter has been described by Morris, Ewart,<sup>4</sup> Galliard,<sup>5</sup> Kroner,<sup>6</sup> and Ayrolles.<sup>7</sup> F. S. Watson<sup>8</sup> was the first in America (1885) to describe ureteral stricture. Farlow,<sup>9</sup> Kelly,<sup>10</sup> Fenger,<sup>11</sup> Hunner<sup>12</sup> and others have made similar observations.

With the advent of the cystoscope and the injection of an opaque solution<sup>13</sup> into the ureter and kidney pelvis, the diagnosis of ureteral abnormality is frequently made. Owing to the large number of clinical studies and the lack of studies on the urinary tract at the autopsy table, the following investigation was undertaken.

### MATERIAL

In 300 consecutive autopsies, in which the abdomen was opened, at the University of Maryland Hospital, a special study was made of the genitourinary tract. Of

this number 185 were males and 115 females. Of the former, 23 cases showed ureteral dilatation.

### CASE REPORTS

**CASE 1.** A. P., colored, aged fifty-nine years.

*Clinical Diagnosis.* Multiple stricture of urethra; vesical calculi; chronic cystitis; chronic nephritis; uremia; generalized arteriosclerosis.

*Autopsy No. 925.* Urinary organs: capacity, right 120 c.c., left 100 c.c.

*Urethra.* A mass of scar tissue is found on the posterior and lateral walls, 4 to 5 cm. from the meatus. Proximal to this stricture the urethra is dilated, measuring 1.5 to 2 cm. in diameter. Mucosa is of a dark red color. Within the prostatic urethra there are two calculi. The anterior and larger one measures 4.5 cm. in length and 1 cm. in diameter. This calculus is composed for the most part of white granular material. Near its base and embedded in it, there is seen another calculus which measures 1 cm. in diameter, rectangular in shape, and of a yellowish-brown color. The base of the first calculus is concave, and into its cavity the second smaller calculus is laid. The prostate shows no enlargement.

*Bladder.* The bladder is distended with urine and its walls measure 1.8 to 2.2 cm. in thickness. The mucosa about the trigone is swollen and of a dark greenish-black color, while the remainder of the mucosa shows numerous hemorrhagic spots. The ureteral orifices measure 3 mm.

*Ureters.* The left is markedly dilated from the bladder wall to the ureteropelvic junction. Diameter varies from 1.5 to 3 cm. On section, the wall measures 1 to 1.5 mm. with the mucosa visible throughout. The right varies in diameter from 1.2 to 3 cm. On section the wall measures 1 to 1.5 mm. in thickness, with the mucosa visible throughout.

\* From the Department of Pathology, University of Maryland. Read before the Chicago Urological Society, November 23, 1926.

## Carson—Ureteral Dilatation

**Kidneys.** The left kidney measures 12 by 5.5 by 4.5 cm. The right kidney measures 12 by 5.8 by 4 cm. The capsules are thickened and are removed with resistance. On section the cortices are thinned out, and the cut surfaces present a large number of cysts. Between these cysts there is a stroma of the remains of the kidney tissue, embedded in which are large blood vessels. Near the upper pole of the left kidney, there are two small abscesses, 1 cm. in diameter, containing a quantity of thick yellowish exudate. The pelves and calyces are markedly dilated and walls are thinned out to 1 mm. in thickness.

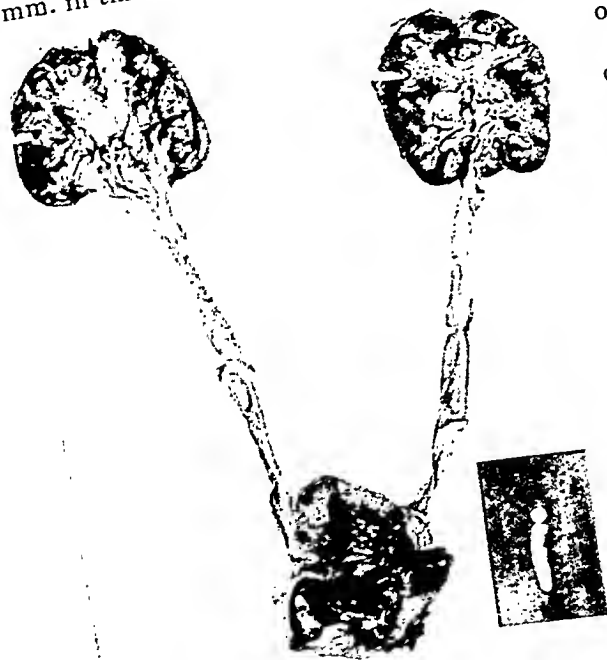


FIG. 1. CASE I. Calculi from urethra; dilatation of prostatic urethra; hypertrophy of bladder wall; ureteral dilatation, bilateral; hydronephrosis, bilateral.

**Anatomical Diagnosis.** Stricture of anterior urethra; dilatation of urethra, proximal to stricture; calculi in prostatic urethra; hypertrophy of bladder wall; hydronephrosis; hydroureter; bilateral; multiple abscesses of left kidney; gangrenous cystitis; hemorrhagic infiltration of anterior bladder wall.

**CASE II.** W. K., white, aged thirty-eight.  
**Clinical Diagnosis.** Hodgkin's disease.  
**Autopsy No. 973.** Urinary organs: capacity, right 10 c.c., left 50 c.c.  
**Bladder.** The serous surface of the bladder

shows a number of small, irregularly rounded, firm, whitish nodules. Muscular wall shows no thickening. On section the organ is seen to contain a small quantity of clear urine. Ureteral orifices and vesical orifice show no changes. A number of small firm lymph nodes are found along and among the vessels of the pampiniform plexus.

**Ureters.** On the left, from the base of the bladder up to the left kidney, a large number of enlarged firm lymph nodes are found, many of which are pressing upon the ureter. The diameter of the left ureter varies from 1 to 2.5 cm., with the widest portion above the pelvic brim. On section the wall measures 1 to 1.5 mm. in thickness, the mucosa is visible throughout. The right shows no noteworthy changes.

**Kidneys.** The left measures 11 by 5 by 3 cm. The capsule strips off easily, leaving a smooth, pale surface. On section the medullary portion is thinned out, due to a marked dilatation of the pelvis and calyces, the line markings are indistinct in outline. The right measures 7 by 3 by 3 cm. On section the architecture is well preserved.

**Anatomical Diagnosis.** Hodgkin's disease with extensive involvement of the retroperitoneal lymph nodes, those about the pancreas, spleen, and celiac axis, and mesenteric lymph nodes; submucosa of stomach, serous surface of bladder and lymph nodes along the left ureter. Hydroureter, left; hydronephrosis, left; acute fibrinous pericarditis, etc.

**CASE III.** W. C., white, aged thirty-four.  
**Clinical Diagnosis.** Carcinoma of the stomach.  
**Autopsy No. 975.** Urinary organs: capacity, right 20 c.c., left 12 c.c.

**Ureters.** The right ureter varies from 2.5 to 7 mm. in diameter, the narrowest point being 3 cm. below the ureteropelvic junction; above this point the ureter is definitely dilated. On section the wall measures 1 to 1.5 mm. in thickness. The lumen, 3 cm. down, is but 1 mm. in diameter. Mucosa is visible throughout.

**Kidneys.** Left 15 by 6 by 5 cm. Right 14 by 6 by 4 cm. Capsules strip off with ease leaving a smooth pale surface. At the lower pole of the right kidney a cyst 4 mm. in diameter is seen. On section the architecture of each kidney is fairly well preserved. The right kidney, pelvis and calyces are dilated.

**Anatomical Diagnosis.** Carcinoma of the stomach, with metastases to lymph nodes along lesser curvature of stomach, and mesen-

terie lymph nodes; stricture of ureter, right 3 cm. down; hydroureter, right; hydronephrosis, right; purulent bronchiolitis; lobular pneumonia, etc.

CASE IV. W. K., white, aged forty-two.

*Clinical Diagnosis.* Typhoid fever, lobular pneumonia.

Autopsy No. 977. Urinary organs: capacity, right 9 c.e., left 15 c.e.

*Ureters.* The left ureter is 30 cm. in length and varies in diameter from 3 to 10 mm., the lower 8 cm. measuring 8 to 10 mm. in diameter. On section the wall is 1 mm. in thickness. Mucosa smooth and glistening throughout. The intramural portion has a lumen of 2 mm. Right ureter and kidneys show no noteworthy changes.

*Anatomical Diagnosis.* Multiple ulcerations of Peyer's patches and solitary lymph follicles of the ileum, cecum and colon; hypertrophy of thyroid gland; dilatation of lower 8 cm. of left ureter.

CASE V. W. C., white, aged twenty-two.

*Clinical Diagnosis.* (Operative.) Subserous hemorrhage in pyloric end of stomach, probably due to poison.

Autopsy No. 981. Urinary organs: capacity, right 10 c.e., left 20 c.e.

*Bladder.* The muscular wall measures from 4 to 6 mm. in thickness. Mucosa smooth and glistening throughout. Right ureteral orifice 1 mm. Left ureteral orifice 3 mm. On section of the left ureteral orifice a hard yellowish calculus is seen occupying the intramural portion of the ureter which measures 6 by 8 mm.

*Ureters.* Left shows a moderate dilatation from the bladder wall up the ureter, 10 to 12 mm. in diameter, the pelvic portion being the widest. On section the wall measures 1 mm. Mucosa smooth and glistening, except the lower 4 cm., where the mucosa is dark red in color. Right ureter and kidney pelvis show no dilatation.

*Anatomical Diagnosis.* Acute gastritis; hemorrhagic infiltration into muscular layer of lesser curvature; acute ileocolitis; acute nephritis, tubular; calculus in left ureterovesical orifice; dilatation of left ureter; lobular pneumonia.

CASE VI. J. S., white, aged eighty-six years.

*Clinical Diagnosis.* Stricture of urethra; complete retention of urine; cystitis; pyelitis.

Autopsy No. 989. Urinary organs: capacity, right 50 c.e., left 50 c.e.

*Urethra.* At the junction of the anterior and membranous urethra a mass of scar tissue is seen which extends completely around the urethra; proximal to this scar tissue there are two lacérations in the mucosa due to false passage of sounds. The mucosa is of a dark reddish color throughout with a yellowish foul-smelling exudate in the prostatic portion.

*Prostate.* It is hard and nodular, partially occluding the urethra.

*Bladder.* Capacity, 1000 c.c. Wall measures 4 mm. in thickness. Mucosa is of a light red to dark red color throughout, ureteral orifices 3 mm., gaping.

*Ureters.* The ureters are dilated from the bladder wall to the kidney pelvis, varying in diameter from 8 to 14 mm. On section the walls measure 2 mm. in thickness. Mucosa in each ureter shows numerous areas of a dark red color.

*Kidneys.* The capsules strip off with increased resistance, leaving a dark red granular surface with several small cysts in the cortex. On section the cortical and medullary zones are of a dark red color with the vessels standing out prominently. Line markings are indistinct in outline; pelves and calyces are moderately dilated, with the mucosa of a dark red color.

*Anatomical Diagnosis.* Stricture of urethra; fibrotic prostate; dilatation of bladder; ureteral dilatation, bilateral; hydronephrosis, bilateral; chronic diffuse nephritis (arteriosclerotic type); acute urethritis; cystitis; ureteritis; and pyelitis.

CASE VII. R. K., colored, aged forty-seven.

*Clinical Diagnosis.* Carcinoma of the bladder.

Autopsy No. 990. Urinary organs: capacity, right 25 c.c., left 35 c.c.

*Prostate.* The prostate is small, firm in consistency, nodular, and on section it is of a yellowish-gray color.

*Bladder.* The wall of the left side and fundus measure 2.5 cm., on the right side 1 cm., in thickness. The mucosa is visible on the right side, the remaining portion showing a rough ulcerating surface. The trigone is of a dark red color, with the ureteral orifices measuring 1 mm. The vesical orifice is grayish-red in color and the mucosa cannot be made out.

*Ureters.* Right varies in diameter from 6 to 24 mm. Its serous surface is smooth and glistening. On section the wall is seen to vary





cm. below the ureteropelvic junction. On section the wall measures 1.5 mm. in thickness. Mucosa visible throughout.

*Kidneys.* The capsules strip off with resistance, leaving a dark red granular surface. On section the architecture is poorly preserved, with thinning out of the cortex. There is a dilatation of the pelvis, major and minor calyces in each kidney.

*Anatomical Diagnosis.* Syphilitic mesoarteritis; arteriosclerosis; adenoma of prostate; dilatation of bladder; ureteral dilatation, bilateral; hydronephrosis, bilateral; cystitis; chronic ureteritis, bilateral; cholelithiasis.

CASE IX. J. C., white, aged seventy-nine.

*Clinical Diagnosis.* Hypertrophy of the prostate.

Autopsy No. 1028. Urinary organs: capacity, right 35 c.c., left 32 c.c.

*Prostate.* The lateral lobes are markedly enlarged, obliterating the urethra and projecting into the bladder, the left lobe being the larger. Enucleation is easily performed. It is firm in consistency and on section there are several areas of a grayish-white color irregular in outline.

*Bladder.* The wall measures 8 mm. in thickness. Mucosa is of a dark red color throughout. Moderate trabeculation is present. The left ureteral orifice is gaping, measuring 2 mm.; the right ureteral orifice measures 1 mm.

*Ureters.* The ureters are dilated from the bladder wall to the ureteropelvic junction, varying in diameter from 7 to 14 mm., with the lower 10 cm. having the greatest diameter. On section the walls measure from 1.5 to 2 mm. in thickness. Mucosa is visible with areas of a dark red color in each ureter.

*Kidneys.* The capsules are removed with difficulty, leaving a pale rough surface of a dark red color. Scattered over this surface numerous small yellowish-white areas varying in diameter from 1 to 3 mm. are seen; several of these, upon removal of the capsule, discharge a purulent exudate. In the lower pole of the right kidney two cysts are seen 4 mm. in diameter. On section the cortex is thickened, with the line markings indistinct in outline. The pelvis and calyces are moderately dilated with the mucosa dark red in color. On section through the pelvic wall it is seen to be thickened.

*Anatomical Diagnosis.* Carcinoma of the prostate, with metastasis to the bladder; ureteral dilatation, bilateral; hydronephrosis,

bilateral; cystitis; ureteritis, bilateral; pyelitis, bilateral; multiple abscesses of the kidneys; chronic diffuse nephritis (arteriosclerotic type).

CASE X. G. D., white, aged twenty-one.

*Clinical Diagnosis.* Typhoid fever; perforation of ileum.

Autopsy No. 1029. Urinary organs: capacity, right 12 c.c., left 15 c.c.

*Ureters.* The right ureter is moderately dilated in the middle third, being 9 mm. in diameter. On section the wall measures 1 mm. in thickness from 12 to 15 cm. below the ureteropelvic junction, and 1.5 mm. above and below this dilated portion. Mucosa is smooth and glistening throughout. The left ureter shows its lower 12 cm. dilated, measuring 13 mm. in diameter, the diameter of the upper 17 cm. being 3 mm. On section the wall measures 2 mm. in the upper part and 1 mm. in the dilated portion. Mucosa is visible throughout.

*Kidneys.* The left kidney pelvis shows a moderate dilatation.

*Anatomical Diagnosis.* Ulceration of Peyer's patches and solitary lymph follicles of ileum and colon; perforation of ileum; acute generalized peritonitis; ureteral dilatation, bilateral; hydronephrosis, left.

CASE XI. W. M. W., white, aged forty-two.

*Clinical Diagnosis.* Chronic diffuse nephritis with acute exacerbation; chronic arterial hypertension; arteriosclerosis.

Autopsy No. 1063. Urinary organs: capacity, right 20 c.c., left 8 c.c.

*Ureters.* The right ureter shows a narrowing 10 c.c. below the ureteropelvic junction, with the lumen 1 mm. in diameter. Above this point the ureter measures 10 to 12 mm. in diameter with the lower 20 cm. measuring 4 to 6 mm. in diameter. On section the wall varies from 1 to 3 mm., the thickest part being 10 cm. down. This strictured area extends along the ureter for 8 mm. A calculus measuring 2 by 3 mm. is adherent to the mucosa just above the stricture. Mucosa is of a dark red color in the upper third, the lower two thirds being smooth and glistening.

*Kidneys.* Left, 12 by 6 by 3.7 cm., cortex 4 mm.; right, 11.5 by 6.4 by 3 cm., cortex 3 mm. The capsules strip off with increased resistance, leaving an irregular granular surface, which is of a pale yellowish-white color mottled with pin-point reddish areas. Between the nodules on the surface the minute capil-

## Carson—Ureteral Dilatation

laries can be seen in the scar tissue. On section the architecture is poorly preserved, the line markings being identified in areas as bright red in color. Major and minor calyces show a dark reddish mucosa. The right pelvis is slightly dilated with a soft calculus 2 mm. in diameter in the middle minor calyces. The minor calyces of the left kidney contain 5 small soft calculi 1 to 2 mm. in diameter.

**Anatomical Diagnosis.** Acute otitis media, bilateral; frontal sinusitis, bilateral; acute tubular nephritis; ureteral stricture, right; ureteral dilatation, right upper 10 cm.; ureteral calculi, right; nephrolithiasis, bilateral. Chronic diffuse nephritis (arteriosclerotic type). Blood culture, streptococcus pyogenes.

**CASE XII.** H. J., white, aged thirty-six years.  
**Clinical Diagnosis.** Meningo-encephalitis; tuberculosis (old) of right lung.

**Autopsy No. 1077.** Urinary organs: capacity, right 70 c.c., left 65 c.c.

**Urethra.** No evidence of stricture.

**Bladder.** Markedly distended. On section 3000 c.c. of clear straw-colored urine are found. Muscular wall measures 4 mm. in thickness.

**Mucosa** smooth and glistening throughout. Ureteral orifices are gaping, 4 mm. in diameter.

**Ureters.** The ureters show a marked dilatation from the bladder to the kidney pelvis, measuring 12 to 15 mm. in diameter. On section the walls show gross changes. Mucosa is of a dark red color in the upper 2 cm. (bilateral) with the remaining portion smooth and glistening.

**Kidneys.** The pelves are moderately dilated, with their mucosa dark red in appearance.

**Anatomical Diagnosis.** Subacute meningo-encephalitis; arteriosclerosis, moderate; tuberculosis of lung, right; pleura; prostate; left seminal vesicle; left vas deferens; epididymitis, left testicle; left adrenal; chronic epididymitis, right; dilatation of bladder; ureteral dilatation, bilateral; acute diffuse pyelonephritis, bilateral.

**CASE XIII.** J. M., colored, aged forty-seven.  
**Clinical Diagnosis.** Generalized arteriosclerosis; cerebral edema.

**Autopsy No. 1104.** Urinary organs: capacity, right 20 c.c., left 20 c.c.

**Urethra.** No evidence of stricture.

**Bladder.** On section 300 c.c. of turbid urine escaped. Muscular wall measures from 4 to 5.5

mm. in thickness. The mucosa is of a pale reddish-gray color at the fundus. The trigone, vesical orifice and approximately 1 cm. of the mucosa surrounding the trigone are of a dark reddish color, with the vessels distended by blood. Surrounding the ureteral orifices and vesical orifice numerous small grayish-white nodules measuring 1 to 2 mm. in diameter are seen. On section these nodules seem to be in the submucosa and elevate the mucosa.

**Ureters.** Moderately dilated from bladder wall to kidney pelvis, varying in diameter from 10 to 14 mm. On section the muscular layer shows no thickening. Mucosa is covered in areas with a purulent material, and is of a dark reddish-gray color. A number of small grayish-white nodules 1 mm. in diameter are seen.

**Kidneys.** The pelves are moderately dilated and of a dark red color. A number of grayish-white nodules 1 to 2 mm. in diameter are seen. These nodules appear to be in the tunica propria.

**Anatomical Diagnosis.** Tuberculosis of mesenteric lymph node; pyelitis granulosa, bilateral; ureteritis granulosa, bilateral; cystitis granulosa; infected hydronephrosis and hydro-nephrosis, bilateral; chronic diffuse nephritis; edema of the brain; lobular pneumonia.

**CASE XIV.** T. B., white, aged nine months.  
**Clinical Diagnosis.** Acute lobar pneumonia;

**Autopsy No. 1112.** Urinary organs: capacity, right 4 c.c., left 20 c.c.

**Bladder.** Contains 5 c.c. of clear urine. Muscular wall measures 2 mm. Mucosa smooth and glistening throughout. Right ureteral orifice 2 mm. Left ureteral orifice scarcely visible. When pressure is applied to left ureter urine escapes through a pin-point opening.

**Ureters.** The left ureter is dilated from the bladder wall to kidney, measuring 10 mm. in diameter. On section the wall is 1 mm. in thickness with the mucosa visible throughout. Section of the ureterovesical orifice taken for microscopical examination.

**Anatomical Diagnosis.** Acute lobar pneumonia; gray hepatization, left, both lobes; acute purulent pleuritis, left; congenital stricture, ureterovesical orifice, left; hydronephrosis and hydronephrosis, left.

**CASE XV.** J. K., white, aged forty-nine.  
**Clinical Diagnosis.** Lobular pneumonia, right.

Autopsy No. 1120. Urinary organs: capacity, right, 30 c.c., left, 50 c.c.

*Prostate.* Moderately enlarged, the lateral lobes projecting into the prostatic urethra, with the left lobe extending into the bladder.

*Bladder.* Muscular wall 3 mm. in thickness. Mucosa is smooth and glistening throughout. Ureteral orifices gaping 3 mm. Trabeculation is seen surrounding the trigone.

*Ureters.* The ureters are dilated from the bladder wall to the ureteropelvic junction, varying from 8 to 16 mm. in diameter, the lower third of the left having the greatest diameter. On section the wall measures 1.5 to 2 mm. Mucosa smooth and glistening throughout.

*Kidneys.* Right, 16.5 by 7.5 by 6 cm., cortex 1 cm.; left, 15 by 6.5 by 5 cm., cortex 1 cm. The capsules strip off with resistance, leaving a finely granular surface. On section the architecture is very poorly preserved. Pelves, major and minor calyces are moderately dilated.

*Anatomical Diagnosis.* Adenoma of prostate; chronic prostatitis; hydroureter, bilateral; hydronephrosis, moderate, bilateral; acute confluent lobular pneumonia, right.

CASE XVI. J. S., white, aged seventy-three.

*Clinical Diagnosis.* Carcinoma of prostate.

Autopsy No. 1130. Urinary organs: capacity, right 100 c.c., left 85 c.c.

*Prostate.* The prostate is very firm and nodular, with marked narrowing of the prostatic urethra. On section there are numerous irregular islets of epithelial cells of a grayish-yellow color. In the lower portion of the prostatic tumor there is a cavity formation, its wall having a definite grayish-black color, giving the appearance of implantation of radium. The outline between the prostate and seminal vesicles is very indistinct. The lymph nodes along the internal and common iliac arteries and abdominal aorta show metastatic deposits.

*Bladder.* The bladder wall measures 4 mm. in thickness. Mucosa is of a dark reddish color. Ureteral orifices gaping 3 mm.

*Ureters.* There is a marked dilatation of the ureters from the bladder wall to the ureteropelvic junction, varying in diameter from 10 to 20 mm., with the greatest diameter above the pelvic brim. On section the walls measure 2 mm. Mucosa is of a reddish color.

*Kidneys.* There is a marked dilatation of the pelvis, major and minor calyces on each side. On section the wall of the pelvis measures 2 mm. Mucosa is dark red in color.

*Anatomical Diagnosis.* Carcinoma of the prostate with metastasis to the lymph nodes along the iliac arteries and abdominal aorta, 3rd, 4th and 5th lumbar vertebrae, bladder wall, seminal vesicles, and right ureter; hydroureter, bilateral; hydronephrosis, bilateral; cystitis; ureteritis, bilateral; pyelitis, bilateral; pyonephrosis, bilateral; duodenal ulcers.

CASE XVII. W. S., colored, aged sixty-three.

*Clinical Diagnosis.* Stricture of urethra; calculus in membranous urethra; acute retention of urine; uremia.

Autopsy No. 1151. Urinary organs: capacity, right 30 c.c., left 25 c.c.

*Urethra.* At the junction of the anterior and membranous urethra there is a mass of scar tissue which obliterates the urethra; proximal to this stricture the membranous urethra is markedly dilated and contains a calculus 5 by 3.2 by 2.5 cm., which has a rough granular surface. Prostatic urethra is dilated. Mucosa is of a dark reddish color throughout, with a yellowish exudate on its surface in areas.

*Bladder.* The muscular wall varies from 8 to 12 mm. in thickness. Mucosa is of a dark greenish-black color throughout, with a putrid odor present. The trigone is reddish-green in color, with the ureteral orifices gaping.

*Ureter.* The ureters show a moderate dilatation from the bladder wall up to ureteropelvic junction varying from 8 to 12 mm. in diameter. On section the walls measure 1.5 mm. in thickness. Mucosa shows numerous areas of a dark red color.

*Kidneys.* The kidney pelvis show a moderate dilatation with the mucosa dark red in color.

*Anatomical Diagnosis.* Stricture of urethra, junction of anterior and membranous; dilatation of membranous urethra, large calculus in membranous urethra; chronic prostatitis; gangrenous cystitis; ureteral dilatation, bilateral; hydronephrosis, bilateral; hypertrophy of bladder wall; chronic epididymitis with abscess formation, left; chronic diffuse nephritis; acute diffuse nephritis.

CASE XVIII. White, aged sixty-two years.

*Clinical Diagnosis.* Carcinoma of bladder; von Recklinghausen's disease.

Autopsy No. 1157. Urinary organs: capacity, right 75 c.c., left 10 c.c.

*Prostate.* The median lobe is moderately enlarged and is seen to be split in its longitudinal axis. Lateral lobes are enlarged, firm in consistency and obstruct the prostatic urethra.

## Carson—Ureteral Dilatation

**Bladder.** The wall is markedly thickened, varying from 10 to 14 mm. Mucosa of the fundus is of a pinkish red color, with one dark red area 1 cm. in diameter due to hemorrhage in the submucosa. At the base and surrounding the right ureteral orifice is seen a large irregular mass, which is rather firm in consistency for the most part; in areas it is soft and friable and the mass extends down to the vesical orifice; on the left lateral wall a tumor mass 1 cm. in diameter is seen. The left ureteral orifice is 1 mm. in diameter.

**Ureters.** The right ureter is dilated from the bladder to the kidney pelvis, varying in diameter from 15 to 20 mm., the widest portion being 10 to 15 cm. down. On section the wall measures 2 mm. in thickness. Mucosa is visible throughout.

**Kidneys.** The right kidney pelvis, major and minor calyces are markedly dilated. On the surface two cysts are seen measuring 2 cm. in diameter. The left kidney has a large single cyst projecting from the upper pole, which has a thin wall. Capacity of cyst 800 c.c.

**Anatomical Diagnosis.** Carcinoma of bladder with metastasis to lymph nodes along iliac arteries, abdominal aorta and spleen; hydronephrosis, right; benign hypertrophy of prostate, all lobes; congenital single cyst, left kidney. Chronic ureteritis, bilateral.

**CASE XIX.** L. W., white, aged sixty-two years.

**Clinical Diagnosis.** Carcinoma of prostate. Autopsy No. 1158. Urinary organs: capacity, right 50 c.c., left 15 c.c.

**Bladder.** There is an opening in the fundus with a rubber tube and gauze pack protruding through it. On the right lateral wall there is an area 3 by 4 cm. which is of a dark greenish-black color with a putrid odor present. Trigone is of a dark red color, with the ureteral orifices visible. The vesical orifice shows numerous tags, and in the prostatic urethra a portion of the prostate is present which is very adherent to the prostatic capsule.

**Ureters.** The right ureter is dilated from the bladder wall to kidney pelvis, varying in diameter from 10 to 14 mm. On section the wall measures 2 mm. in thickness. Mucosa shows numerous areas of a bright red color. Left ureter is moderately dilated, varying in diameter from 8 to 12 mm. On section the wall measures 1.5 mm. in thickness. Mucosa visible throughout.

**Kidneys.** The right kidney pelvis is moderately dilated and of a dark reddish color.

**Anatomical Diagnosis.** Carcinoma of the prostate with metastases to lymph nodes along internal iliac arteries, abdominal aorta, renal arteries and liver; hydronephrosis, bilateral; hydronephrosis, right; gangrenous cystitis; ureteritis, bilateral; acute pyelonephritis, bilateral.

**CASE XX.** W. A., colored, aged fifty-five. Autopsy No. 1165. Urinary organs: capacity, right 60 c.c., left 10 c.c.

**Bladder.** There is a recent operation wound in fundus of bladder. Muscular wall measures 2 to 3 cm. in thickness. The line markings of the muscular wall are indistinct in outline in the outer half, the inner half being of a greenish-black color. Mucosa shows a number of dark reddish areas separated by areas of a distinct greenish-black color. A putrid odor is present. Just above the left ureteral orifice, a diverticulum 2 cm. in diameter is seen.

**Ureters.** The right ureter varies in diameter from 15 to 20 mm. On section the wall measures 1 mm. in thickness. Mucosa shows a number of small irregular dark red areas. These are most numerous in the pelvic portion.

**Kidneys.** The right kidney pelvis, major and minor calyces are moderately dilated; the pelvic mucosa is smooth and glistening.

**Anatomical Diagnosis.** Recent operation wound; absence of prostate gland; acute gangrenous cystitis; hydronephrosis, right; hydronephrosis, right; ureteritis, bilateral; pyelonephritis with abscess formation, bilateral, etc.

**CASE XXI.** S. G., white, aged fifty-six years. Autopsy No. 1171. Urinary organs: capacity, right 28 c.c., left 8 c.c.

**Clinical Diagnosis.** Lobar pneumonia, bilateral; cellulitis of scrotum following attempt at catheterization.

**Urethra.** There is a large amount of scar tissue in the membranous urethra. The proximal half of the pendulous urethra is markedly indurated and covered by a yellowish exudate. Surrounding this area, throughout the perineum, following along the planes of the triangular ligament and Colles's fascia there is a definite infiltration of a foul-smelling fluid of a reddish gray color. The pyramidalis muscle measures 2 cm. in thickness. At a point near the

junction of the left apex of the prostate and left side of the membranous urethra, an ulceration through the urethral wall is seen, with an abscess in its uppermost margin which measures 1 by 1.5 cm.

**Bladder.** The muscular wall is from 6 to 8 mm. in thickness. Mucosa of fundus is of a dark reddish and light pinkish-red color. At the base and surrounding the trigone and vesical orifice it is of a definite grayish-black membranous type of cystitis, with a large amount of whitish material and granules superimposed on this membrane. Right ureteral orifice is not visible. Left ureteral orifice 1 mm.

**Ureters.** The right ureter is dilated from the iliac crest to the ureteropelvic junction, measuring from 15 to 20 mm. in diameter; from the iliac crest to bladder wall it measures 8 mm. in diameter, the muscular wall measuring 2 mm. Mucosa shows a large number of dark red colored areas.

**Kidneys.** The right kidney pelvis, major and minor calyces are moderately dilated, with the mucosa showing irregular areas of a dark red color.

**Anatomical Diagnosis.** Stricture of urethra, with marked infiltration in membranous and pendulous urethra; ulceration of membranous urethra, with periurethral abscess, left side; extravasation of urine into the perineum and scrotum; hydroureter, right; hydronephrosis, right; cystitis; ureteritis, bilateral; acute diffuse nephritis, etc.

**CASE XXII.** Colored, male, aged thirty days. Weight at birth six pounds. Mother's Wasserman was negative and she had no apparent nephritis.

**Autopsy No. 1173.** Urinary organs: ureteropelvic capacity 25 c.c., bilateral.

**Urethra.** Showed no pathological changes.

**Bladder.** The muscular layer measures 3 mm. in thickness. Mucosa is smooth and glistening throughout. Ureteral orifices are scarcely visible.

**Ureters.** The ureters are markedly dilated from the bladder wall to the ureteropelvic junction, measuring 6 to 7 mm. in diameter. On section the walls are thin with the mucosa visible through.

**Kidneys.** The lower pole of each kidney is 1 cm. above the crest of the ileum. The capsules strip off easily, leaving a lobulated surface. On section the architecture is well preserved. The pelves and calyces show no noteworthy changes.

**Anatomical Diagnosis.** Congenital hypertrophy of the heart, displaced to the left; hydropericardium 20 c.c.; hydroperitoneum 100 c.c.; ureteral stricture, intramural portion, bilateral; ureteral dilatation, bilateral; toxemia of kidneys.

**Microscopical Notes.** Sections taken from right and left ureteral orifices show the mucosa to be poorly stained, the submucosa showing edema of the connective tissue cells, with a few mononuclear wandering cells and plasma cells infiltrating in a disorderly fashion. A few young fibroblasts are visible next to the mucosa. The muscular layer of the ureter shows the connective tissue cells between the muscle fibers to be swollen and edematous in appearance, with a moderate number of young fibroblasts, visible. Polymorphonuclear leucocytes are seen infiltrating in a disorderly fashion. The blood vessels in the muscular layer are markedly distended with red blood cells, and show diapedesis of morphonuclear leucocytes. Several nerve bundles are seen well stained.

**Bladder.** Surrounding the ureter, shows its submucosa to be swollen and edematous in appearance.

**Ureters.** Six cm. above bladder; they show the mucosa well preserved, with the tunica propria swollen and edematous in appearance. Muscular layer shows the muscle fibers well stained, and the blood vessels distended with red blood cells. Perivascular lymphatics are visible.

**CASE XXIII.** T. W., colored, aged fifty-nine years.

**Clinical Diagnosis.** Adenoma of prostate; cystitis; ascending urinary infection; uremia.

**Autopsy No. 1190.** Urinary organs: capacity, right, 80 c.c., left, 25 c.c.

**Bladder.** The muscular wall measures 2 cm. in thickness; in areas it is soft and flabby. The mucosa is scarcely visible, most of the bladder being covered with a thick layer of greenish-black necrotic material with yellowish necrotic material in areas. This greenish-black substance extends down into the prostatic cavity, the prostate being absent.

**Ureters.** The right ureter is dilated from the bladder wall to the ureteropelvic junction, varying from 15 to 20 mm. in diameter. The serous surface is of a dark red color. On section the wall measures from 2 to 3 mm. in thickness. Mucosa is of a dark reddish to reddish-green color from kidney pelvis to bladder. The left

## Carson—Ureteral Dilatation

ureter is moderately dilated, varying from 8 to 12 mm. in diameter, otherwise it is the same in appearance as the right.

Kidneys. The pelves, major and minor calyces are dilated, with their mucosa covered with a thick layer of dark reddish exudate.

Anatomical Diagnosis. Adenoma of prostate (surgically removed); hypertrophy of bladder wall; hydroureter, bilateral; hydronephrosis, bilateral; gangrenous cystitis; ureteritis, bilateral; pyelonephrosis, bilateral; etc.

TABLE I  
SUMMARY OF AUTOPSY FINDINGS

Case	Age	Capacity right, c.c.	Dilatation of right kidney pelvis	Capacity left, c.c.	Dilatation of left kidney pelvis	Anatomical diagnosis
I	59	120	+	100	+	Stricture of anterior urethra; calculi in prostatic urethra; gangrenous cystitis
II	38	10		50	+	Hodgkin's disease, retroperitoneal, left
III	34	25	+	12		Carcinoma of stomach; stricture of right ureter 3 cm. down
IV	42	9		15		Typhoid fever
V	22	10		20		Calculi in ureterovesical orifice left
VI	86	50	+	50	+	Stricture of urethra; ureteritis
VII	47	25	+	35	+	Carcinoma of bladder; metastasis to bladder, ureters; ureteral stricture, left 3, right 2. Calculi left ureter
VIII	57	26	+	22	+	Adenoma of prostate
IX	79	35	+	32	+	Carcinoma of prostate
X	21	12		15	+	Typhoid fever, perforation
XI	42	20	+	8		Ureteral stricture right, 10 cm. down. Calculi in right ureter and each kidney
XII	36	70	+	65	+	Meningo-encephalitis
XIII	47	20	+	20	+	Tuberculosis, mesenteric lymph nodes; pyelitis, ureteritis, cystitis granulosa
XIV	9	4		20	+	Congenital stricture, ureterovesical orifice, left
XV	49	30	+	50	+	Adenoma of prostate
XVI	73	100	+	85	+	Carcinoma of prostate, metastasis to right ureter, etc.
XVII	63	30	+	25	+	Stricture of urethra, gangrenous cystitis
XVIII	62	75	+	10		Membranous urethra, gangrenous cystitis
XIX	45	60	+	10		Carcinoma of bladder; adenoma of prostate
XX	62	50	+	15		Carcinoma of prostate, prostatectomy, gangrenous cystitis
XXI	56	28	+	8		Carcinoma of prostate, gangrenous cystitis
XXII	30	25		25	+	Stricture of urethra; extravasation of urine
XXIII	59	80	+	25	+	Stricture of ureter, intramural portion, bilateral
						Adenoma of prostate; prostatectomy; gangrenous cystitis

## DISCUSSION

In 23 males with ureteral dilatation, the right ureter was dilated in 19 instances,

and the left in 18 instances. (Table I.) In 36 of these 37 dilated ureters the condition was acquired, and in one case it was congenital in origin.

TABLE II  
ETIOLOGY OF URETERAL DILATATION

	Case	Right	Left
Stricture of urethra	I	+	+
	VI	+	+
	XVII	+	+
	XXI	+	+
	XXII	+	+
	VIII	+	+
	XV	+	+
	XXIII	+	+
	IX	+	+
	XVI	+	+
Adenoma of prostate	XIX	+	+
	XX	+	+
	XX	+	+
Carcinoma of prostate	VII	+	+
	XVIII	+	+
	III	+	+
Carcinoma of bladder	VII	+	+
	XI	+	+
	XXII	+	+
Stricture of ureter	XIV	+	+
	V	+	+
Stricture of ureter, congenital	XIII	+	+
	IV	+	+
Calculi in ureter	X	+	+
	II	+	+
Ureteritis, granulosa (tuberculosis)	XII	+	+
	XII	+	+
Typhoid fever	II	+	+
	XII	+	+
Hodgkin's disease	II	+	+
	XII	+	+
Central nervous system	II	+	+
	XII	+	+

In the acquired cases the age varied from 30 days to 86 years, with the average at 47 years.

The ureteropelvic capacity varied on the right side from 12 to 120 c.c., the average at 47.5 c.c.; and on the left side, from 15 to 100 c.c., the average at 37 c.c.

The presence of calculi, associated with inflammatory stricture, has been described by Morris, Hunner, and Walther. In this series it is observed that in 4 cases of stricture of the ureter, calculi were found in 2 instances.

In Case v (calculi in left ureterovesical orifice), microscopical examination of the lower 3 cm. of the left ureter showed such a large number of young fibroblasts in the tunica propria and muscular layer that a

narrowing of the lumen would have resulted in time.

In Case XIII, pyelitis granulosa and ureteritis granulosa and cystitis granulosa, which are of rare occurrence, were of tuberculous origin.

#### CONCLUSIONS

1. In 185 consecutive autopsies on males, ureteral dilatation was encountered in 23 cases (12.4 per cent), bilateral 14, right 5, left 4.

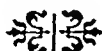
2. Dilatation of the ureter was accompanied by hydronephrosis in 31 instances (88.5 per cent).

3. Infravesical obstruction was the etiological factor in 11 cases (47.7 per cent).

4. Ureteral stricture was found in 5 cases, 4 inflammatory, 1 congenital.

#### REFERENCES

1. CRUVEILHIER. Descriptive Anatomy. Trans. Ed., 1841, p. 586.
2. DESGRANGES. *J. de Méd.*, xxi. Quoted by Le Baron Boyer. *Traité des maladies chirurgicaes*, es, viii, 541-1822.
3. MORRIS, HENRY. *Proc. Roy. M. & Chir. Soc.*, 1876, lix.
4. EWART, WILLIAM. *St. George's Hosp. Rep.*, 1879, x.
5. GALLIARD, L. *Calcul du pancréas se déversant dans l'estomac. Progrès Méd.*, 1880, viii, 796.
6. KRONER. *Arch. f. Gynæk.*, 1881, xvi.
7. AYROLLES. *Soc. Anat. de Par.*, lix.
8. WATSON, F. S. *Boston M. & S. J.*, 1885, exiii.
9. FARLOW, J. W. *Boston M. & S. J.*, 1889.
10. KELLY, H. A. *Johns Hopkins Hosp. Bull.*, 1890, 234.
11. FENGER. *Chicago M. Rec.*, 1893, iv, 164.
12. HUNNER, G. L. *Johns Hopkins Hosp. Bull.*, 1918, xxix, 1.
13. HUNNER, G. L., and WHARTON, L. R. Pathological findings in cases clinically diagnosed as ureteral stricture. *J. Urol.*, 1926, xv, 57.
14. HALLÉ, A. J. M. N. *Uretérites et Pyélites*. Paris, 1887.
15. KUSTER. *Arch. f. klin. Chir.*, 1892, xlv, 850.
16. VAN HOOK, W. Experimental union of the ureter after transverse division. *J. A. M. A.*, 1893, xx, 225.
17. MYNTER, H. *Ann. Surg.*, 1893, xviii, 658.
18. VOELCKER, F., and VON LICHTENBERG, A. *Pyelographie. München. med. Wchnschr.*, 1906, liii, 105.
19. GERAGHTY, J. T., and FRONTZ, W. A. *J. Urol.*, 1918, ii, 161.
20. WHITE, H. P. W. *Brit. J. Surg.*, 1925, xiii, 247.
21. EISENDRATH, D. N. Ureteral stricture, kinks and abnormal inserts. *J. Surg., Gynec. & Obst.*, 1925, xli, 557.
22. HUNNER, G. L. Radiographic evidence of the association of ureteral stricture and urinary calculi. *J. Urol.*, 1925, xiii, 497.
23. HUNNER, G. L. Drainage as a factor in renal disease. *J. Surg., Gynec. & Obst.*, 1926, xliii, 624.
24. CARSON, W. J. Ureteral stricture. *Urol. & Cutan. Rev.*, 1924, xxviii, 386.
25. CARSON, W. J. (Case VII reported) Metastatic carcinoma in the ureter. *Ann. Surg.*, 1925, lxxxi, 142.
26. CARSON, W. J. (Case I reported) Gangrene of the bladder. *J. Urol.*, 1925, xiii, 205.



#### [SURGICAL SUGGESTIONS]

IF the situation of a small bone abscess has not been estimated accurately enough for it to be tapped by the first drilling, other drill holes can be made with little damage to the bone, or the surgeon may defer the completion of the operation to determine roentgenographically the relative levels of the abscess and his first drill hole.



# INTESTINAL OBSTRUCTION DUE TO STRICTURE

## FOLLOWING HERNIOTOMY FOR STRANGULATED HERNIA\*

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TREVES<sup>1</sup> defines stricture of the intestine as that form of narrowing of the lumen of the bowel which is produced by changes in the layers constituting the intestinal wall. He classifies stricture of the intestine into three groups: (1) cicatricial or simple; (2) cancerous; (3) congenital.

The cases concerned in this discussion apply to the first group of cicatricial or simple strictures.

Cicatricial stricture of the intestine is, in the overwhelming majority of instances, the direct result of some form of ulceration of the intestinal wall.

Although ulceration of the intestine is the result of a variety of causes, only a few ever lead to the formation of cicatrices and secondary stricture formation. Of these, the most important forms are those due to tuberculosis, syphilis or stercoral ulceration and, in exceedingly rare instances, typhoid ulceration.

For the formation of stricture following ulceration, a mechanical factor is involved. The contraction of a flat ulcer will not produce stricture, since only ulcerations that are annular or involving a large part of the intestinal wall in a circumferential direction, can produce stricture.

Besides ulcerative conditions, another infrequent cause of stricture of the intestine is trauma, or blunt injury to the abdomen, such as a blow or fall or being run over. Schloffer<sup>2</sup> has assembled from the literature 10 undoubted cases of such origin, including one of his own. All of these cases involved the small intestine only. The mechanism of this type of stricture is dependent upon the trauma tearing the mesentery from its attach-

ment to the intestine, and thereby cutting off the arterial blood supply from a given segment of the bowel. The collateral circulation being just insufficient to sustain complete viability of the segment, a slow fibrotic process ensues, involving all of the layers of the intestine, followed by contraction and stricture formation.

The two cases reported herewith are instances of tight stricture formation progressing slowly, many weeks after operation for strangulated hernia. The literature contains a few similar instances. The first case recorded is that by Garré<sup>3</sup> in 1892; a second case was reported by Maass<sup>4</sup> in 1895. The masterful exposition of Maass's case accounts for stricture formation as a result of necrosis of the mucous layer of the intestine; and, referring to these two cases, Treves states "the stricture which may form after strangulated hernia is due to cicatrization and follows upon ulceration or limited gangrene of the involved bowel."

The cases of Garré and Maass were strictures covering a considerable length of intestine, involving the entire loop clamped in the hernial sac. Vascular obstruction produced gangrene of the mucous lining, and the stenosed area was found lined with atrophic and smooth mucous membrane.

There is, however, still another type of stricture occurring after hernial strangulation, exemplified by my two cases and a few others in the literature. These are characterized by tight stricture formation involving an area of the bowel for about 2 cm. The stenosed area is hard, white and fibrous and all gross resemblance to intestine has disappeared. The intestine

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proximal to the stricture is dilated and hypertrophied and that distal to the stricture is collapsed.

Schmieden and Scheele<sup>5</sup> attribute the occurrence of this slowly progressive annular type of stricture to thrombosis of the mesenteric arteriole supplying that area of intestine.

The cases that I have been able to find in the literature of slowly progressive intestinal obstruction following operation for strangulated hernia, were all of the inguinal or femoral variety. My first case occurred in a ventral hernia.

Among the reported cases the period of time elapsed from the date of the reduction of the hernia was from a few days to several years, but in most instances from one to eight months. The ileum was involved in all cases except two, in which the jejunum was stenosed.

Intestinal involvement is usually very limited in extent and annular "as though a narrow tape had encircled the bowel." In one case two strictures are described.

#### CASE REPORTS

**CASE I.** Mrs. G. S., thirty-four years old, was operated upon for ovarian cyst seven years previously. During a subsequent pregnancy, a ventral hernia occurred at the site of the scar. For a period of years the hernia gave no trouble and was controlled by a belt.

In August, 1924, the hernia became strangulated and she was operated upon by Dr. M. M. Stark of New York. He tells me that strangulation at that time had progressed for six hours and that the constricted loop of ileum contained in the sac appeared to be viable. Convalescence was uneventful.

The patient was discharged cured after two weeks. About three weeks after the operation she began to suffer from intestinal cramps, distention and constipation. This condition became slowly aggravated. Abdominal pains became intense. Laxatives were ineffectual and the bowels moved only by enemata. The cramps bore no relation to the intake of food and recurred at intervals of five to ten minutes. Borborygmus was constantly observed by the patient.

The diagnosis of chronic intestinal obstruction was apparent and it was thought to be due to adhesions or a fixed kink in the bowel.

Operation was performed October 13, 1924. The small intestine was found much distended and seemed to fill the entire abdominal cavity. After search a segment of ileum was brought into the wound that proved to be the site of the obstruction. At this point two thick bands of omentum were adherent and encircled the constricted portion of the intestine. After ligating and severing these bands, it was found that the constriction was not due to the omental bands, but that the lumen of the intestine at this point was apparently entirely obliterated.

The intestine at this site consisted of a fibrous constriction covering an area of 2 cm. A lateral anastomosis was made, leaving a stoma of 4 cm. The patient made an uneventful recovery. She has recently been reported in perfect health.

**CASE II.** Mrs. H. S., aged fifty-six, had a left femoral hernia for five years, during which time there were three attacks of incarceration, each relieved by non-surgical measures.

On February 22, 1927, the hernia became strangulated and could not be relieved by measures previously employed. The patient was removed to the Sydenham Hospital and operated upon by me, six hours after the beginning of strangulation.

Upon opening the hernial sac a clear dark sanguinous fluid escaped. A loop of small intestine was found protruding from a narrow neck. The constriction was relieved and the strangulated loop of intestine was carefully examined. Pulsation was present in the mesentery, the intestine was dark red and turgid. Application of warm saline solution restored peristalsis, and there seemed to be every indication that the intestine was viable.

The intestine was replaced in the abdominal cavity and the operation completed in the usual manner. Convalescence was uneventful. The patient was discharged from the hospital two weeks after the operation.

A few weeks later she noticed that unusual cramp-like sensations would occur several hours after taking food. She had been in the habit of using laxatives and she now found that this seemed each time to aggravate her distress. Omitting the cathartics, she found the

## Eising—Intestinal Obstruction

pains continued as before and were increasing in severity. Several months transpired, during which period the pains became nearly continuous and constipation was relieved by enemata. During this time there were several attacks of extreme pain with great abdominal distention and vomiting for which morphine was administered. In May, 1927, I saw her during an interval when there was no pain. She had been subsisting upon liquid food and had lost fifteen pounds.

Having clearly in mind the case reported above and the likelihood of such a contracture following operation for strangulated hernia, I felt sure that this was a similar sequence. I expressed my belief to some of my colleagues, but none of them supported my interpretation of the cause of the obstruction. Gastrointestinal roentgen-ray examination was made but no definite conclusion could be drawn from the films. I felt so sure, however, that this case also was one of chronic intestinal obstruction due to cicatricial contracture of the intestine that I advised operation at an early date.

The patient refused, however, to submit to operation and sought other medical opinions. During this time she had several very severe acute seizures, for which she was taken to different hospitals. Each time during the period of observation, she recovered from her attack and refused operation. Not until September 18, 1927 did I see her again. At that time I urged her to go into the Sydenham Hospital for operation. She had then lost thirty-five pounds. She was much emaciated and peristalsis was plainly visible through the thin abdominal wall.

Operation, September 20, 1927. Upon opening the abdomen, the intestine for the most part was found collapsed. Following along the ileum an area of constriction was found 3 feet from the cecum. The intestine proximal to this constriction was considerably thickened and hypertrophied whereas distal to the stricture it was collapsed. About 6 inches of intestine were resected, including the strictured area. A lateral anastomosis was made, leaving a wide stoma. The patient made an uneventful recovery.

**PATHOLOGICAL REPORT BY DR. MAX GOLDZIEHER**

Gross. The piece of intestine shows a circular constriction, above which the intestine

is considerably distended. The circumference of the gut above the stricture is 3 in. and below the stricture 1.5 in. The wall of the intestine above the stricture is considerably thickened, evidently due to an enormous hypertrophy of the musculature. When the proximal loop of the intestine is filled with water and the specimen held in the vertical position, the stricture does not permit the water to pass. Under pressure the water passes in a narrow stream.

The rugae are quite regular until the funnel-shaped narrowing of the lumen is approached. In this narrow area there are longitudinal folds instead of the circular ones as above and below the lesion. At the site of the stricture, the folds stand out most about the narrowest part of the tube and impress one as almost papillary vegetations. About this area much scar tissue can be seen in the submucosa, dissecting the layers of the muscular coat and connecting with the scar tissue of the serosa. The intestine distal to the stricture is normal.

**Histologic.** There is marked hypertrophy of the mucosa and of the musculature, with scar tissue in the submucosa and about the outer surface of the musculature. This scar tissue shows many foci of round cell infiltration.

**Diagnosis.** Intestinal stricture due to scarring of the intestinal wall.

Both of these patients suffered much embarrassment from loud gurgling noises that could be heard most of the time. The gurglings continued during their sleep.

## SUMMARY

These two cases serve to remind us that slowly developing obstruction due to fibrous stricture of the intestine may follow operative relief of strangulated hernia.

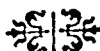
The type of hernia may be inguinal, femoral or ventral.

A satisfactory appearance upon careful inspection of the damaged intestine and mesentery at the time of operation for strangulated hernia does not yield absolute proof of the viability of the segment involved.

A "follow-up" after the operation for strangulated hernia should continue for several months.

## REFERENCES

1. TREVES, F. Intestinal Obstruction, Its Varieties with Their Pathological Diagnosis and Treatment. N. Y. 1899.
2. SCHLOFFER, H. Ueber traumatische Darmverengerungen. *Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, Jena, 1900, vii, 1-137.
3. GARRÉ, C. Über eine eigenartige Form von narbiger Darmstenose nach Brucheingklemmung. *Beitr. z. Klin. Chir.*, 1892, ix, 187.
4. MAASS, H. Über die Entstehung von Darmstenose nach Brucheingklemmung. *Deutsche Med. Wchnschr.*, 1895, xxi, 365-367.
5. SCHMIEDEN, V., and SCHEELE, K. Darmstenosen, Darmgeschwülste, Ileus. *Spezielle Pathologie und Therapie innerer Krankheiten*. Berlin, 1922, vi, Pt. 1, pp. 403-458.



## TUBERCULIN TREATMENT AFTER NEPHRECTOMY

Though tuberculosis of the ureter, bladder, and testicle possesses a natural tendency to heal after removal of an infected kidney, yet practical experience shows that this healing process can be hastened and confirmed by giving tuberculin. I have employed tuberculin injections in a large number of cases for more than twenty years, and I have had the opportunity during the period of seeing a number of similar cases that have not had tuberculin treatment. The process of cure in those treated with tuberculin has been quicker and more certain than in those treated without it.

The exhibition of tuberculin calls for considerable care and experience. The slightest over-dose of tuberculin and all the good work of months is overthrown in one night, a prolonged negative phase being produced and the disease flaring up once more. Such incidents bring disrepute on tuberculin.

I am convinced by experience that certain vaccines, such as tuberculin in small doses, can effect wonders; but there comes a point as the dosage is raised where the vaccine becomes a poison rather than a curative agent. Small doses may stimulate resistance, large doses overwhelm and break down resistance. If only the vaccinists would be content to stick to small doses they would have far more success from their treatment. I have found from practical experience that good results ensue from the employment of Koch's new T.R. tuberculin. The main point is that the dose must be a very small one.

No tuberculin should be given until at least six weeks after an operation, at which the patient undergoes a large auto-inoculation and for a time becomes hypersensitive, nor should it be given if there is active lung trouble. When the tuberculin injections are started, begin with a dose of one hundred-thousandth of a milligram. Sometimes even with this small dose there is an intense reaction. If so, try a two hundred-thousandth of a milligram and work up from this as a basic dose. In the average case a dose of one hundred-thousandth of a milligram does not cause any reaction. If so, work up every ten days by one ten-thousandth of a milligram, stopping at any stage if there is the slightest sign of reaction, and keeping at that dose until no reaction occurs. In the course of ten or twelve injections a dose of one ten-thousandth of a milligram will be reached. Continue to give one ten-thousandth of a milligram once a fortnight for from one to two years, and on no account exceed this dose, for though it is often possible to give one five-thousandth of a milligram without harm, yet even that dose in some persons, and any dose above that amount in most persons will be likely to set up a severe negative phase.

If at the end of two years there are still traces of pus and tubercle bacilli in the urine, the injections of tuberculin should go on regularly until the pus and tubercle bacilli have disappeared. In some cases the injections must be employed for as long as three or four years before the urinary tract is completely rid of the disease.—FRANK KIDD in *The Practitioner*.

# THE CLINICAL BEHAVIOR OF THE NORMAL AND THE DISEASED GALL BLADDER

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PHILADELPHIA

THE gall bladder, like the appendix, is known for its sinful ways. Its functional importance compared with its potential evil is insignificant. Since the first cholecystectomy in 1882 it has been the prey of the predatory surgeon who has with all justice added it to his surgical trophies. By a fair estimate ten per cent of adults have gallstones and there is probably an equal incidence of cholecystitis without stones so that the economic as well as the medical significance of disease of the gall bladder is difficult to overestimate.

In this paper we shall not be concerned with the craftsmanship of surgical treatment, nor with the controversy between drainage and removal, nor with the merits and demerits of non-surgical biliary drainage. The intense concentration of research on the gall bladder during the past few years has given us a few new facts and left with us many new problems unsolved.

The practical anatomy and histology of the gall bladder have an important bearing on its functional and pathological significance. It lies against the under surface of the right lobe of the liver and is partially covered by a reflected layer of peritoneum. The stomach, duodenum, and colon completely enclose it except for its very tip as it peeks from under the edge of the liver. Perforation rarely occurs into the free peritoneal cavity but is usually preceded by inflammatory adhesion to a neighboring viscus with resulting fistulous communication. The fistula most often connects with the duodenum. That the gall bladder enjoys a double source of blood and lymphatic supply is a fact not always duly recognized. The cystic artery carries a relatively richer supply of blood and under higher pressure than obtains in the liver. In addition there are many small

vessels which come to the gall bladder from its area of attachment to the liver, an area which readily permits interchange of infection between the two viscera. In chemical cholecystitis produced by the intravenous injection of Dakin's solution the chief avenue of attack is through these small vessels. Both sources of blood supply are accompanied by lymphatics.

The mucous lining of the gall bladder is composed of tall columnar cells and is thrown into numerous folds, thereby increasing its surface area which is proportionally much larger than that of any other hollow viscus and is an important factor in its absorptive power. The mucous glands of Luschka occur in clusters in the submucosa and as crypts which extend for variable distances into the wall. The muscular layer of the gall bladder, composed of bundles arranged in several directions, is well developed and furnishes the motor mechanism for emptying the viscus.

It is possible that the early symptoms of disease of the gall bladder may be caused by derangement of its function before the appearance of tangible evidence of structural changes. This may be the significance of the so-called "strawberry gall bladder." The name indicates a recognizable yellow deposit of ester of cholesterol in the lining cells and in large cells of the submucosa which may vary in amount from that barely visible to a quantity sufficient to cause a rich golden yellow appearance. In gall bladders showing a goodly amount of the substance we have often found stones and usually evidence of inflammatory changes. Patients in whom this condition has been revealed at operation, have complained chiefly of reflex gastric symptoms as qualitative food distress and discomfort from gas.

A study of mildly diseased gall bladders showed that the early changes appeared in the submucosa as congestion, edema and round-cell infiltration. The inflammatory reaction then proceeds deeper into the wall, disorganizes the muscular layer and often localizes about the crypts and intramural glands. We are not prepared to say what bearing these findings have on the probable route by which infection reaches the gall bladder, but they do not seem to support the contention that infection extends through the lymphatics from the liver. When stones are present there is marked proliferation of glands and a notable increase in the amount of muscular tissue. Sometimes the crypts are so deep that they resemble herniations of the mucosa or intramural diverticula and only a thin layer of serosa and connective tissue prevents actual penetration of the wall. In cholecystitis these deep crypts are often surrounded by inflammatory reaction which may readily allow tiny perforations to give rise to pericholecystitis, adhesions and probably actual fistulous communication with neighboring organs. The lining cells of the mucosa not only form a protective layer but have an important part in the absorptive function of the gall bladder. They usually remain intact even in the presence of marked infection of the gall bladder but their appearance often changes from the tall columnar to low cuboidal and even to flat squamous-like epithelium. We have seen a squamous epithelioma of the gall bladder. Infection of the gall bladder rarely remains localized. It frequently extends to the liver and it has been shown that inflammatory changes in the extrahepatic ducts are usually associated with cholecystitis.

The effects of disease of the gall bladder are often immediate but usually remote. A sleeping surgical lesion, it lies ever ready to devastate its host. Cholecystitis is an enemy in the very heart of our most important resources. The surgeon and too often the pathologist in the morgue find the evil consequences of its presence in a

liver damaged beyond repair, a pancreas fibrotic beyond the possibility of resolution or in the white heat of disintegration, or a calculous obstruction of the common duct with its resulting effects on the entire biliary apparatus. The gall bladder may be the focus for a wider dissemination of infection. That myocarditis is often benefited by removal of a diseased gall bladder has been repeatedly verified since the original observation of Kehr. Cholecystitis may be the cause of intestinal bleeding and arthritis.

The voluminous literature on the functional significance of the gall bladder is largely the product of speculative and fanciful imagination; the facts are few. Only by the experiments of recent years have we gained an insight into the behavior of this organ. Its removal has little effect on the economy of the body and thousands of lives have continued more happy without it. Although lack of evidence of the functional importance of an organ is no justification for its indiscriminate removal, yet, as Aschoff says, when the gall bladder is diseased nature has performed a functional cholecystectomy. We know that the gall bladder is a retention depot for bile; that the retained bile becomes concentrated about ten times by the absorption of fluid; that the reaction is changed from alkaline to acid and that a mucous substance is added to it. The question of the significance of these changes we must pass over in silence.

The mechanism for the filling of the gall bladder is an extrinsic one. Bile is secreted continuously by the liver and in an amount almost equal to the daily output of urine but its discharge into the duodenum occurs at intervals too infrequent and in quantities too small to account for the total quantity which leaves the liver. As it flows down the ducts its escape into the duodenum is prevented and controlled by a sphincteric mechanism at the lower end of the common duct. The result is an increase in intraductal pressure which forces the bile back through the cystic duct into the gall



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bladder. It is not conceivable that the bladder could fill in the absence of closure of the lower end of the common duct because the passage is devoid of valves or other retarding devices. The identity of the sphincter of Oddi has been held in doubt by some observers who claim that the discharge of bile is regulated by the tonicity and peristaltic activity of the duodenum. However, I do not believe that there has been sufficient evidence presented to warrant rejection of Oddi's claims of an anatomical sphincter especially since his work has been verified by others. This sphincteric mechanism is concerned chiefly with the filling of the gall bladder and has little to do with the flow of bile or the emptying of the gall bladder. McMaster and Elman showed that the secretory pressure of the liver is sufficient to force bile back into the gall bladder when the lower end of the common duct is closed. When the gall bladder is excluded and the common duct closed the secretory or intraductal pressure may rise to 320 mm. of bile before the secretion of bile suddenly stops but under normal conditions the pressure never exceeds 100 mm. to 150 mm., which about equals the resistance offered by the sphincter of Oddi. The fasting state increases the tonicity of the sphincter so that it will withstand a pressure of 200 mm. to 250 mm. The sight of food as well as eating and the contact of acid lower the resistance of the sphincter and cause a flow of bile from the common duct. In brief we may say that the gall bladder fills as the result of back pressure of bile in the common duct incident to sphincteric tonus of its lower end; and that bile flows into the duodenum when the intraductal pressure overcomes the resistance of the sphincter, when inhibitory influences reach the sphincter as the result of the taking of food, and when the gall bladder contracts.

Now that the gall bladder has been filled how does it empty? This question has been the center of much controversy. The contention of one authority that the contents of the gall bladder do not leave it through the cystic duct has been convincingly refuted. Kodama likens the gall bladder to the side-arm of a hydrostatic unit and says that it empties by siphonage incident to the flow of bile down the common duct past the orifice of the cystic duct. This theory presupposes that the common duct and the gall bladder have rigid walls, but they are elastic and collapsible. During countless explorations the surgeon has never seen the gall bladder in the act of contracting nor has he ever found it completely collapsed and empty. These observations have lead to the theory that the viscus does not empty by its own power but is dependent on external pressure influences incident to respiration and so forth. By filling the gall bladder with iodized oil Whitaker was able to observe the process of emptying under the fluoroscope. He saw the gall bladder decrease in size and the opaque liquid flow through the cystic duct into the common duct and out into the duodenum. He showed that contraction of the gall bladder occurred after a meal of egg yolk, it was not influenced by the tonus of the sphincter of Oddi because cutting the sphincter had no effect upon emptying, and that duodenal peristalsis was not a factor in the discharge of bile. He noted that the process of emptying was very sensitive to anesthesia and that trauma produced by clamping the wall of the gall bladder markedly delayed the emptying time. The mere presence of fat in the stomach or duodenum is without effect; there must be actual digestion before contraction occurs. Olive oil by mouth or vein and even liquid petrolatum given intravenously produced emptying. The action of magnesium sulphate is to paralyze the muscle around the end of the common duct thereby causing an outflow of bile and allowing the elastic tissue of the distended gall bladder to express some of its contents, but this action is slight. Boyden in his study of the behavior of the human gall bladder in response to the ingestion of food was able to show in



cholecystograms that adrenalin by vein causes more efficient emptying of the gall bladder than any other reagent; that the shape of the viscus changes after meals; that it delivers the greater part of its contents during the first part of the meal, and that it acts intermittently both for contraction and filling.

Higgins and Mann presented the most convincing demonstration of the process and factors concerned in the emptying of the gall bladder. They opened the abdomen of a dog under local anesthesia, thus eliminating all factors of external pressure, and observed that the gall bladder emptied by its own muscular contraction and that food was essential for any reduction in size. The viscus does not empty by a wave of peristalsis but isolated areas of contraction occur which gradually change the pattern and size of the gall bladder. The viscus is never completely empty and does not collapse like a deflated balloon but maintains a certain amount of tone. Emptying occurred independently of the action of the sphincter of Oddi and at times the gall bladder was distended with bile while the sphincter was relaxed. These workers ligated all hepatic ducts thereby eliminating the secretory pressure of the liver and bile flow, placed a rubber catheter in the common duct to eliminate the influence of the sphincter, a T tube in the duodenum to administer a fat meal and the abdomen was left open to eliminate intra-abdominal pressure. During an observation period of one hour the gall bladder did not contract. A fat meal was then given into the duodenum and it was shown by a manometer on the tube in the common duct that the gall bladder was emptying by a series of contractions and in three hours the maximum pressure reached 200 mm. to 225 mm. of bile and was maintained for thirty minutes.

To recapitulate, the gall bladder empties by reason of its own muscular contractions and in a natural manner only in response to food. Adrenalin has a specific action in causing the gall bladder to contract. The

sphincter of Oddi is essential for the filling of the gall bladder but has very little to do with its emptying. The most that can be reasonably claimed is that induced relaxation of the sphincter reduces intraductal pressure with an outflow of duct bile and if the gall bladder is distended its elasticity may force a small amount of its contents into the common duct and out into the duodenum, but contraction of the gall bladder does not occur.

Since the gall bladder is very sensitive to extraneous factors it would seem that the subject of its nervous control is worthy of reconsideration under more modern methods of experimentation such as those used by Higgins and Mann in their study of the muscular mechanism.

The nervous mechanism of the gall bladder probably does not differ from that of other abdominal viscera. The work of Bainbridge and Dale in 1905 seems most tenable. They found that stimulation of the pure sympathetics which run in the splanchnic nerve caused relaxation of the gall bladder after extraneous pressure had been excluded. After paralysis of the sympathetic nerves stimulation of the vagus caused contraction of the gall bladder. Atropine by paralyzing the vagus endings and adrenalin by stimulating the sympathetic endings caused a rapid fall of tone. It will be recalled that the fibers of the vagus or parasympathetic end about local ganglionic cells in the wall of the viscus while preganglionic fibers of the sympathetic end around cells of large sympathetic ganglia from which the long postganglionic fibers run to the part. Section of the sympathetic therefore abolishes inhibitory influences while cutting the vagus has little effect on the motor function which is maintained by the local ganglionic cells. Whitaker showed that the gall bladder emptied in a normal manner after both vagi had been cut and that even after complete denervation marked contractions occurred after a fat meal. In other words the gall bladder, like the intestine, has an intrinsic motor mechan-

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ism and distension is probably a stimulus to autonomic contraction. The motor impulses for the sphincter of Oddi probably come from the sympathetics and the inhibitory fibers run in the vagus. Assuming that gall bladder colic is the result of overdistension or muscular spasm the pain should be most satisfactorily relieved by the administration of atropine and adrenalin.

From a physiologic standpoint the effects of disease on the gall bladder are not only a delay in emptying time but the actual accumulation of residual bile because contraction is less efficient. In cholecystitis the gall bladder cannot empty properly because of its diseased walls and very little bile enters it because of the relaxed sphincter of Oddi. The concentrating power is the function least disturbed as indicated by the histological finding that the lining cells of the mucosa remain intact except in advanced acute inflammation and by the fact that diseased gall bladders usually contain concentrated bile. It thus becomes a plausible theory that gallstones are caused by a combination of forces incident to infection of the gall bladder: highly concentrated residual bile whose reaction remains alkaline favors the deposit of cholesterol and the crystallization of calcium carbonate. In the test tube cholesterol and calcium carbonate can be precipitated out of the bladder bile of man or prevented by slight additions of base or acid.

From our present knowledge it is probably safe to make certain deductions regarding the relationship between the function and symptoms of a diseased gall bladder. Stones are usually present in the gall bladder when there has been severe colic and the histologic examination of such gall bladders has shown in nearly every specimen the characteristic finding of notable hypertrophy of the muscular coat which in all likelihood is a work hypertrophy incident to muscular spasm or unusual efforts of contraction by which the gall bladder has tried to empty itself in

the presence of obstruction. The fact that the symptoms of cholecystitis are most likely to occur during the digestion of a meal and especially after the taking of certain kinds of food rich in fat is most readily explained by the known relationship between digestion and contraction of the gall bladder. The contraction of a diseased organ incident to a physiologic stimulus may be both exaggerated and productive of pain. The gastric symptoms of cholecystitis differ little from those which occur with duodenal ulcer and appendicitis and are probably caused by pylorospasm which is a reflex phenomenon.

Efforts have been made to establish a relationship between gastric acidity and disease of the gall bladder and even to claim for it a diagnostic significance analogous to the leucocyte count in acute appendicitis. Hohlweg says in an experimental and clinical study that in cases after cholecystectomy there is a decrease and usually a complete absence of free hydrochloric acid. Gatewood reports achlorhydria or hypoacidity in forty-five per cent of 192 patients with gallstones. Wohl says that in 69 per cent of cholecystectomized patients who were examined from one to five years after operation there was deficiency or total absence of free hydrochloric acid. These findings are supported by reports from Fravel and Hurst. However, Rost in his experiments on dogs failed to reveal any change after cholecystectomy in the chemical reaction of the gastric and pancreatic juices. In 56 cases of disease of the gall bladder I found the gastric acidity low in none, normal in 21.4 per cent, high in 67.8 per cent, and no free hydrochloric acid in 10.7 per cent. If it is true that removal of the gall bladder causes a marked decrease in gastric acidity then it would seem that cholecystectomy would have a physiologic basis as an addition to the operations for duodenal ulcer. As a matter of fact cholecystitis and duodenal ulcer are frequently coexistent in the same patient.

Cholecystography is a new star in the

biliary sky and owes its present popularity chiefly to the genius and persistent advocacy of Graham. Like all new methods it has been enthusiastically received and severely criticized. It has won the support of eminent roentgenologists and clinicians. The surgeon with his usual distrust of laboratory methods reserves his opinion as to its value. The diagnostic efficiency of the procedure is said to be very high. It has also provided a new means for studying the mechanism of the biliary tract. Kirklin of the Mayo Clinic recently reported the results of 3357 cholecystographic examinations made in a period of seven months. Of these, 1647 were reported positive and 1710 negative. In 447 of the entire series of cases operation was performed either for disease of the gall bladder or other abdominal conditions. During the same period cholecystectomy was performed in 639 cases in 339 of which cholecystographic studies had been made previously. In 324 cases of marked disease of the gall bladder, with or without stones, the cholecystogram was positive in 89.1 per cent. In 339 cases of cholecystic disease, including slight cholecystitis, the cholecystogram was positive in 87.3 per cent. In the 447 patients, reported with and without disease of the gall bladder, in whom exploration was made, the cholecystogram was correct in 82.1 per cent. The highest percentage of error occurs in cases that give normal cystograms. From this report the diagnostic efficiency of cholecystography seems to be very good. As MacCarty says, the real test of the method should rest on the actual findings after cholecystectomy and the clinical history and gross external appearance of the organ should not be used to check the test. There is an excellent opportunity for serious error if roentgenologic findings in the absence of stones and when not supported by the clinical history and physical examination are allowed to assume a major factor in the indications for operations on the gall bladder. On the other hand a negative cystogram can be safely disregarded when the clinical history and physical examination have clearly indi-

cated disease of the gall bladder after exclusion of disease of the stomach. A pitfall in roentgenologic diagnosis is the diseased gall bladder which sometimes casts a shadow even when it does not contain dye.

Cholecystography has stimulated anew the study of the physiology of the biliary tract. The physiologic factors underlying the method are essentially the specific excretion of the dye by the liver and the concentration of the dye after it enters the gall bladder. The crux of the situation is the filling of the gall bladder. The dye as it comes in the bile from the liver is not sufficiently concentrated to cast a shadow. The filling of the gall bladder whether in health or disease depends upon the working of a sphincteric mechanism at the lower end of the common duct. The diseased gall bladder usually contains bile so that total obstruction of the cystic duct can be largely discounted as a factor in the failure of bile to enter the gall bladder. It is also true that the bile in diseased gall bladders is usually highly concentrated so that failure of this function explains only a few instances of invisible gall bladders. The remaining major factor to account for the phenomena of cholecystography is the closure of the lower end of the common duct and the results of this diagnostic procedure are only indirect evidence of the condition of the gall bladder. When the function of the gall bladder is impaired by disease or abolished by extirpation the bile ducts become dilated and the sphincteric mechanism of the common duct, at first normal or hypertonic, later offers less resistance or is totally incompetent to prevent the constant flow of bile into the duodenum. As a result only a small quantity of bile enters the gall bladder at probably infrequent intervals. Under these circumstances the gall bladder obviously will not cast a shadow when dye is administered. Sphincters become hypertonic when irritated by adjacent inflammatory lesions as occurs in pylorospasm with duodenal ulcer. The sphincter of the common duct may be affected in like manner in the early stages of cholecystitis and pancreatitis and also

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possibly in duodenal ulcer and appendicitis, and under these conditions the gall bladder although diseased may fill with dye and cast a shadow.

Eusterman notes the fact that in gastric hyperacidity especially in the presence of duodenal ulcer false positive cholecystographic findings (faint shadow or invisibility) are frequently reported. Both Plummer and he have also called attention to the fact that in cases of gastric anacidity, to a lesser degree, especially in the asthenic, constipated, often neurotic type of patient similar false positive results are obtained. The probable explanation for this discrepancy is hypotonus of the sphincter of Oddi making it impossible for the gall bladder to fill. The false positive findings in cases of hyperacidity might be explained by the increased demand for alkali in the duodenum causing a more or less continuous outflow of bile so that the gall bladder cannot sufficiently fill and concentrate enough bile to cast a shadow.

In our opinion the invisible and visible gall bladders of cholecystography are phenomena dependent almost entirely upon the sphincteric mechanism of the common duct.

The large percentage of error which occurs in so-called normal and visible bladders after administration of the dye may be decreased by reporting as pathological those cases in which the shadow of the gall bladder persists beyond the normal limits of emptying time or after the ingestion of a meal because when diseased the gall bladder is very slow to empty.

It would be interesting to take a series of cases in which the gall bladder was visible by cholecystography and to repeat the examination after induced relaxation of the sphincter of the common duct by direct application of magnesium sulphate through a duodenal tube or by a sufficient dose of atropine. After this procedure it would probably be impossible to obtain a shadow of the gall bladder.

It is now well established that an individual suffers no inconvenience or ill effect by removal of the gall bladder. It was noted long ago that the bile ducts became dilated

after cholecystectomy and it was while seeking an explanation of this that Oddi was led to the discovery of the sphincter at the lower end of the common duct. The experimental work of Mann and Judd showed that the sphincter was responsible for the dilatation. For a short time after cholecystectomy intraductal pressure is greatly increased in order to overcome the resistance of the sphincter. As a result the ducts dilate. Later the sphincter becomes incompetent, bile flows more or less continually into the duodenum and intraductal pressure is much below normal. Counseller and McIndoe examined the liver in 26 cases of disease of the biliary tract by the cellodion-corrosin method and found that there was dilatation of the bile duct tree when the gall bladder was diseased and that the dilatation was directly proportional to the functional damage of the gall bladder. When the gall bladder has been removed or damaged by disease the appearance time of jaundice after obstruction of the common duct is much shorter than when the organ is normally present indicating that for a time it is able by its functions of concentration and storage to take care of all bile secreted. After cholecystectomy there is no attempt to form a new gall bladder nor evidence of any change to compensate for its lost function. If it is true that regurgitation of bile incident to obstruction at the lower end of the common duct is an etiological factor in pancreatitis then the beneficial effects of cholecystectomy in this disease might be explained by the resulting incompetency of the sphincter and the constant flow of bile into the duodenum.

## SUMMARY

The serious consequences of disease of the gall bladder far exceed its functional importance so that even when slightly diseased its removal is justifiable when the symptoms have reached the stage of pain and distress.

The gross and histologic anatomy of the organ favor stasis and retard recovery from infection.

Filling of the gall bladder is possible only by an increase in intraductal pressure resulting from tonic closure of the lower end of the common duct which forces bile into the cystic duct. When the sphincter of Oddi is incompetent the gall bladder can not fill.

The gall bladder empties through the cystic duct by its own muscular power which is sufficient to overcome intraductal pressure as well as the resistance of the sphincter. Food is the normal and most efficient stimulus to contraction of the gall bladder.

The vagus or parasympathetic is the motor nerve for the gall bladder and inhibitory for the sphincter of Oddi. The sympathetic supplies inhibitory impulses to the gall bladder and motor impulses to the sphincter.

The symptoms of cholecystitis can be explained on the basis of pathologic physiology.

The phenomena of the findings of cholecystography are directly related to the mechanism of the sphincter of Oddi and pertain only indirectly to the condition of the gall bladder.

The physiologic effects of disease of the gall bladder are delay in emptying, accumulation of highly concentrated residual bile and failure to acidify the bile, factors which favor the formation of stones. Equally important effects are dilatation of the ducts and hypotonus of the sphincter at the lower end of the common duct. The latter phenomena also occur when the gall bladder has been removed.

#### BIBLIOGRAPHY

1. ASCHOFF, L. Orthology and pathology of extra-hepatic bile ducts in their relation to cholelithiasis. *Klin. Wchnschr.*, 1923, ii, 957-958.
2. BAINBRIDGE, F. A. and DALE, H. H. Contractile mechanism of the gall bladder and its extrinsic nervous control. *J. Physiol.*, 1905, xxx, 138-155.
3. BOYDEN, E. A. Study of the behavior of the human gall bladder in response to the ingestion of food. *Anat. Record*, 1926, xxx, 201-255.
4. BURDEN, V. G. Surgical pathology of the gall bladder. *Ann. Surg.*, February, 1927, lxxxv, 239-246.  
Observations on the histologic and pathologic anatomy of the hepatic, cystic and common bile ducts. *Ann. Surg.*, 1925, lxxxii, 584-597.
5. COUNSELLER, V. S. and MCINDOE, A. H. Dilatation of the bile ducts. (Hydrohepatosis). *Surg., Gynec., and Obst.* 1926, xliii, 729-740.
6. DRURY, D. R., McMASTER, P. D. and ROUS, P. Observations on some causes of gall stone formation. *J. Exper. Med.*, 1924, xxxix, 403-423.
7. ELMAN, R. and McMASTER, P. D. The physiological variations in resistance to bile flow to the intestine. *Ibid.*, 1926, xliv, 151-271.
8. EUSTERMAN, G. B. Personal communication. 1927.
9. FRAVEL, R. C. The occurrence of hypochlorhydria in gall bladder disease. *Am. J. Med. Sc.* 1920, clix, 512-517.
10. GATEWOOD. Achlorhydria in gall bladder disease. *J. A. M. A.* 1923, lxxxi, 904-906.
11. HIGGINS, G. M. and MANN, F. C. Observations on the emptying of the gall bladder. *Am. J. Physiol.* 1926, lxxviii, 339-348.
12. HOHLWEG, H. Über Starungen der Salzsäureabscheidung des Magens bei Erkrankungen und nach Extirpation der Gallenblase. *Deutsch. Arch. f. Klin. Med.* 1912, cviii, 255-276.
13. HURST, A. F. Cholecystitis and gall stones in the light of recent research. *Practitioner*, 1923, cxi, 321-342.
14. JUDD, E. S. and BURDEN, V. G. Internal biliary fistula. *Ann. Surg.*, 1925, lxxxi, 305-312.  
Obstructive jaundice. *Am. J. Med. Sc.*, 1925, clxix, 888-896.
15. JUDD, E. S. and MANN, F. C. Effect of removal of the gall bladder. *Surg., Gynec., and Obst.* 1917, xxiv, 437-442.
16. KEHR, H. Gall stone disease. Phila., P. Blakiston's Son & Co., 1901.
17. KIRKLIN, B. R. and MACCARTY, W. C. Cholecystography. Proceedings of the staff meetings of the Mayo Clinic. January 5, 1927.
18. KODAMA, S. A model to simulate the mechanism of emptying of the gall bladder. *Am. J. Physiol.*, 1926, lxxvii, 385-388.
19. MANN, F. C. Production by chemical means of a specific cholecystitis. *Ann. Surg.*, 1921, lxxiii, 54.
20. McMASTER, P. D. and ELMAN, R. On the expulsion of bile by the gall bladder and a reciprocal relationship with the sphincter activity. *J. Exper. Med.* 1926, xliv, 173-198.
21. NEILSON, M. M. and MEYER, K. F. Reaction and physiology of the hepatic duct and cystic bile of various laboratory animals. *J. Infect. Dis.* 1921, xxviii, 510-541.
22. ROST, F. Functional significance of the gall bladder. *Mitt. a. d. Grenzgeb. d. Med. u. Chir.* 1913, xxvi, 710.  
Secretion after cholecystectomy, *Ibid.*, 1924, xxxviii, 1-148. Abst. *J. A. M. A.* 1924, lxxxiii, 1722.
23. ROUS, P. and McMASTER, P. D. The concentrating activity of the gall bladder. *J. Exper. Med.* 1921, xxxiv, 47-73.
24. SWEET, J. E. The gall bladder: its past, present and future. *Internat. Clin.* 1924, i, 187-226.
25. WHITAKER, L. R. Mechanism of the gall bladder. *Am. J. Physiol.*, 1926, lxxviii, 411-436.
26. WOHL, M. G. Is the gastric secretion altered in gall bladder disease? *New York Med. J.*, 1917, cv, 347-349.

# THE MANAGEMENT OF CHRONIC CHOLECYSTITIS

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THE gall bladder is an organ of indeterminate function, not necessary to life or the maintenance of good health. It is entirely absent in many of the mammalia and is present in some and absent in other animals of the same species. Rare instances have been reported where it has been congenitally absent in the human being.

Infection of the gall bladder may be associated with gallstone formation, cholesterol deposit in the mucosa, infected bile contents, or with pericholecystic adhesions, but the essential pathological changes are found in the gall-bladder wall itself.

Recognition of well advanced disease is simple, but because of the insidious onset and variability of symptoms, the condition is often unrecognized until it is too late for effective treatment and complete relief. Delay in the institution of treatment is responsible for the great majority of incomplete cures and recurrences. Gall-bladder disease is a condition of adult life, when restorative and compensatory tendencies are less pronounced than in the earlier years; and patients with advanced pathological changes can in no way be so handled as to correct the damage already done to stomach, liver, pancreas or heart function. As long as an infected gall bladder exists in the body, even when producing no symptoms, it remains a threat to the health and even to the life of the individual. Improvement in end-results will occur only when treatment is instituted in the earlier stages, before permanent pathological and functional changes have occurred in the liver and associated organs.

Chronic cholecystitis may result from an acute attack or may appear gradually. Rarely is the gall-bladder infection an

entirely primary one. Infections in the teeth, bony sinuses, alimentary and urinary tracts may result in metastatic involvement of the gall bladder, and this secondary lesion may remain active long after the original focus has disappeared or has been eradicated. The secondary gall-bladder infection may in turn serve as a base for further lymphatic or hematogenous extension to other organs, so that at times the gall-bladder focus may be only a link in a chain of processes originated and continued in other parts of the body.

## CAUSES OF INFECTION

It is unlikely that infection often occurs from the bile contents, as cultures of the gall-bladder wall produce organisms much more frequently than do cultures of the bile itself. This indicates that a direct upstream transmission of infection from the duodenum through the medium of infected duct and gall-bladder bile is unlikely to occur. Should such a route be followed, it is more reasonable to suppose that infection ascends through the peridochal lymphatics to the liver and thence to the gall-bladder wall.

Invasion is commonly secondary to a deposit of organisms in the portal circulation of the liver, with resultant liver infection and direct extension through the rich lymphatic network which begins in the liver, fills the area of attachment of the gall bladder to the liver and continues beneath the serosa of the gall-bladder wall, providing a means of direct bacterial spread.

Infection may be borne directly by a septic embolus or metastasis from a distant area of infection, or may spread directly from a contiguous organ.



The most common infecting organism is *Bacillus coli*. Staphylococci, various strains of streptococci and typhoid bacilli are occasionally found and a large proportion of cultures of both gall-bladder wall and contents are sterile, even when the organ is definitely diseased and functionless. This indicates death or attenuation of the organisms after tissue damage has been produced. Typhoid bacilli are found much less frequently with uncomplicated cholecystitis than with stone formation, and it is notable that with the great decrease in the incidence of typhoid in recent years there has been no corresponding decrease in either cholecystitis or cholelithiasis.

It is possible that factors other than bacterial infection enter into the production of cholecystitis, chief of which is an increase in the cholesterol content of the blood, probably resulting from a change in the blood metabolism, with corresponding changes in the chemical composition of the blood. Hypercholesterolemia is present most commonly in association with cholesterol stones, strawberry gall bladder, arteriosclerosis, and during the latter months of pregnancy. Routine exploration of the biliary tract during abdominal operations in women reveals the presence of gallstones in about 8 per cent of cases. This may explain the occurrence of gallstones in middle-aged women as a result of the repeated hypercholesterolemia of pregnancy. Mann has demonstrated that by the introduction of Dakin's solution intravenously a non-bacterial cholecystitis can be uniformly produced.

Gallstones, even of the silent variety, are always accompanied or preceded by some degree of cholecystitis, and failure in diagnosis may be due to lack of complaint by the patient or to lack of care in obtaining a detailed history.

Cholecystitis is more common in females, although the preponderance is not so marked as in gallstones. It is rarely seen before the age of twenty, and thereafter may occur at any age. Of interest is a

case seen at autopsy where a cholecystitis with many stones was found in a child of eight. It is perhaps more common in youth than has been thought, but remains unsuspected because spontaneous and complete recovery so often follows.

#### SYMPTOMS

The picture during exacerbations of acute cholecystitis and in cases associated with gallstones is characteristic, but exact diagnosis in chronic cases is rendered difficult by a lack of uniformity of clinical symptoms. Such variation is due largely to the presence of concurrent pathological tissue changes in other organs, with corresponding commingling of functional changes and symptoms.

Stones are found in about one-half of all cases of gall-bladder disease; in those without stones the symptoms are milder and less typical. Chronic cholecystitis without symptoms referable to the gall bladder does exist as a definite pathological entity and produces other symptoms which are relieved by removal of the gall bladder. These symptoms are referable to the digestive tract, often closely simulating those of gastric or duodenal ulcer, and only during acute attacks are such manifestations present as may render possible a correct diagnosis from the history alone.

Chief among the complaints are a sense of fullness, tightness or oppression in the epigastrium, appearing shortly after meals and accompanied by belching, or less frequently by vomiting, either of which produces some relief. Acids, fats and fried foods particularly provoke attacks of indigestion, and frequent small feedings or the use of alkalis gives no especial relief. As a rule, food causes more persistent distress but less actual pain than does food taken in the presence of gastric or duodenal ulcer, and this distress appears with no such regularity after meals as it does in the latter condition. In about one-half of the cases, achylia or hypochlohydria is found, but the administration of hydrochloric acid by mouth



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is of little aid. In many instances this decrease in acidity results from admixture of regurgitated bile and stomach contents. Constipation may or may not be present, and whereas the skin is often sallow, jaundice is infrequent. Recurrent and persistent attacks of hiccough due to irritation of the phrenic nerve may be the sole indication of trouble.

Two types of acute attack occur. In the first, the outstanding symptom is pain of an acute stabbing type, originating in the right upper quadrant or epigastrium, and radiating along the course of the phrenic nerve to the right costal margin, directly through to the scapula or to the right shoulder. Pain is referred to the left costal margin in a surprising number of mildly acute attacks. In uncomplicated cases no such overwhelming pain is found as is seen in acute gallstone colic, and muscular rigidity is absent.

In the second type of acute attack, the distinguishing features are faintness, pallor, nausea, a sense of great prostration and fear of impending death. Relief follows a period of noisy belching or, less often, of vomiting. It is notable that the vomiting of a primary stomach disease ceases when the stomach is emptied, whereas the patient with gall-bladder disease continues to vomit bile-stained material regurgitated from the duodenum as a result of persistent waves of reversed peristalsis. Constipation seems to be a definite factor in precipitating this kind of attack.

In both types, the temperature remains normal or subnormal and in only exceptional instances is a slight fever present. The pulse rate is uniformly slow. As a point in the differential diagnosis between acute appendicitis and acute exacerbation of chronic cholecystitis, the pulse rate is of great value, for in the former it is rather consistently elevated above 90, regardless of the temperature, and in the latter it is perceptibly slower than normal.

After the subsidence of an acute attack, soreness and tenderness without cor-

responding muscle spasm are found in the region overlying the gall bladder. This may be the only time during the entire course of the disease when any local signs can be made out. Acute attacks are not so pronounced in cases of chronic cholecystitis with marked infiltration and inflammation of the gall-bladder wall alone as they are in cases with gallstones and little evidence of infection.

Clinical diagnosis can be made with relative precision from the history alone in cases in which a history of repeated acute attacks can be elicited. However, despite careful and detailed observation a certain number of patients subjected to operative procedure show no pathological evidence of disease. By the addition of certain laboratory and roentgen-ray methods light has been shed on the obscure and doubtful cases that make up this group, and great aid has been given to the surgical management of the more serious operative risks.

Foremost of the laboratory tests that help in the handling of appropriate cases is the phenoltetrachlorophthalein test of Rosenthal, by means of which the function of the liver parenchyma may be estimated. Because of the constant association of hepatitis with cholecystitis, evidence of disturbance of liver function is of importance in these cases. The degree of dye retention in the blood gives a definite indication of the disturbance in liver function, a retention as high as 8 per cent after fifteen minutes being considered normal.

With jaundice or suspected jaundice due to bile-duct obstruction, the Van den Bergh test is of value in determining the presence and exact extent of the jaundice. Particularly is this procedure a help in determining the proper time for removal of common duct drains in cases of obstructive jaundice when uncertainty exists as to whether the jaundice is stationary or receding. It is of no value in cases of cholecystitis without jaundice.

## ROENTGEN-RAY DIAGNOSIS

Two methods of roentgen-ray visualization are available. In the older direct method most exacting technique and skillful interpretation yielded positive evidence in only one-half or less of the cases associated with bilirubin-containing stones and in a smaller percentage of cases without stone, while pure cholesterol stones were rarely visualized.

Since the introduction of the Graham method of visualization, great advances have been made in diagnosis. A considerable personal experience with the intravenous method shows over 90 per cent of correct diagnoses as related to clinical findings at operation and pathological examination of the removed tissue. A study of patients visualized before and after operation indicates that cholecystography by the intravenous method may be safely employed with satisfactory results in a properly equipped office in competent hands, and that hospitalization is not necessarily required to successfully and comfortably carry out the procedure. Reactions are rare when patients are properly prepared and a careful intravenous technique is followed.

A smooth and uniform shadow of distinct outline appearing and disappearing in normal time should be considered to indicate a negative test or normally functioning gall bladder. In only a few instances have such negative visualization patients come to operation and in all of these the appearance of the biliary tract was normal.

Actual visualization of opaque gallstones is indicated by the appearance of a definite negative shadow or filling defect, and the presence of non-opaque stones by a persistent mottled area of shadow. In certain instances gallstones may be visualized in a gall bladder that is functioning normally. Sooner or later it is probable that inflammatory changes will occur with corresponding variation in function.

Deformities in shadow margins producing an irregular outline indicate pericholecystic adhesions which in chronic

inflammation of the gall bladder with adhesions to the stomach or duodenum are apt to be rough and irregular, whereas with omental adhesions the variations are smooth and clean cut. Variations in the intensity and time of appearance and disappearance of the shadow indicate disturbances of function of the biliary mechanism. Complete absence of a shadow is always pathological and points to definite chronic cholecystitis, bile-duct obstruction, the presence of gallstones or hepatitis of some degree. Faintness of the shadow occurs with failure of the proper concentrating function of the gall-bladder wall and is especially suggestive when associated with persistence of the shadow beyond the normal emptying time.

Delay in the appearance of a normal-sized shadow directs attention especially to the probability of an accompanying hepatitis or disturbance of the hepatic or cystic ducts, whereas delay in emptying time, indicated by persistence of a shadow of normal size and density beyond the normal time of subsidence and disappearance means definite gall-bladder infection or cystic or common duct obstruction.

In all cases the intravenous method has been employed and I have no personal data on the oral method.

It is often advisable to combine with visualization procedures a routine gastrointestinal roentgenographic and fluoroscopic examination. This combined method yields further information as to the status of the gall bladder, particularly as to the presence of deforming adhesions and of spastic changes in the stomach and duodenum not due to ulceration.

## PATHOLOGICAL CHANGES

The nature and extent of tissue changes in the gall bladder depends largely on the presence or absence of gallstones. Stone formation results from precipitation of cholesterol often accompanied by a surface deposit of lime, and may be due to the presence of irritation, foreign material, bacteria, mucus or cellular detritus, or to

increased concentration of cholesterol in the blood. This constituent may be increased because of physiological body activities or of disturbed processes of metabolism which, with stasis of bile and consequent excessive absorption of water, result in a condition favorable to precipitation of stone.

In non-calculous cholecystitis, the pathological changes are found in the gall bladder wall, bile ducts, and in anatomically adjacent or functionally related organs. Thus hepatitis, which may be the primary source rather than the result of a secondarily infected gall bladder, is found in 60 per cent of all cases, pancreatitis of some degree in 15 per cent, and adhesions to adjacent viscera in many others.

It is not always easy to recognize cholecystitis at operation; and it must be borne in mind that inflammation may subside, leaving an organ to all appearances normal but still harboring products of infection. This is the type of case in which pre-operative functional tests as determined by roentgen-ray visualization are of inestimable help.

Catarrhal inflammation produces edema and thickening of the wall and conditions may vary from a simple edema, not detectable on gross examination of the unopened gall bladder, to the thickened, shrunken, sclerotic organ densely embedded in adhesions that is found in cases of long-standing infection. Any or all of the coats may be involved and histological repair and symptomatic recovery do not necessarily progress hand in hand, since permanent anatomical change may persist during intervals of apparent clinical improvement. Adhesions about the infected area are common and may involve duodenum, omentum, pylorus, colon or abdominal wall; they may by traction or scar contraction cause symptoms referable to the gastrointestinal tract, covering up entirely the picture of cholecystitis.

Recognition of disease in a gall bladder that is not obviously involved requires thorough and accessible exposure, permit-

ting direct inspection and palpation with an opportunity for exploratory incision into the cavity of the gall bladder in certain instances. The color of the serous surface, thickness of the mucosa, serous surface striations and character of the bile all aid in arriving at a conclusion.

The normal gall bladder is soft and supple, blue in color, and has a highly polished surface. It can be readily emptied by moderate pressure and on transillumination shows a dull translucency. After fasting or immediately after a meal rich in fats it becomes tense and distended and can be emptied only by the use of considerably increased pressure. Such a gall bladder is normal and in the absence of other findings cannot be accepted as evidence of disease.

Outstanding among the typical findings at operation are a change from the normal blue color, surface dullness and loss of sheen, and palpable thickening of the wall due either to edema or to fibrous tissue formation.

In mild cases the fibrous change is antedated by a visible increase in the deposit of subserous fat, producing a uniformly lighter color or light streaks along the course of the blood vessels. In the strawberry type of gall bladder, there may be visible through the unopened wall characteristic fine white striations. The mucosa is covered with small elevated yellow specks, which, against the contrasting reddened background, produce a resemblance to the surface of a strawberry. Direct inspection of the opened gall bladder in other types of infection may show the mucosa to be edematous and swollen, red or purplish in color, and very friable, and conditions may vary from this extreme state to an apparently normal mucosa. The remaining coats of the wall may be dilated and thinned or contracted, scarred and thickened.

Enlargement of the lymph nodes along the common duct, particularly the sentinel cystic gland at the junction of the cystic and common ducts, is a significant finding.

When this gland is enlarged, hard and possesses some mobility, it may on casual examination be mistaken for a calculus. Cystic and common duct involvement occurs rarely but in the presence of stones or as a result of scar contraction from adhesions.

Hard, nodular enlargement of the head of the pancreas may be due to lymphatic or direct extension resulting in pancreatitis. Not every case of pancreatitis is serious or fatal, but every one carries a constant threat of disaster, and the known association of cholecystitis and pancreatitis is a definite reason why the former should receive early and adequate treatment.

In the presence of adhesions to the pylorus or duodenum it is necessary to determine whether the primary focus is in the gall bladder or the gastrointestinal tract. In the latter an ulcer, particularly of the primary penetrating variety, may cause infection and adhesion to the adjacent non-infected gall bladder, and as scarring increases it becomes progressively difficult to locate the original source of infection.

Closure of the foramen of Winslow secondary to cholecystitis has been reported, but occurs so infrequently that it is not to be considered a characteristic finding at any stage of the disease.

Aspirated bile may appear macroscopically normal and in most instances is sterile, but recovery of thick, stringy or tarry bile is indicative of infection.

#### CONCURRENT DISEASES

Concurrent disease attributable to gall-bladder infection is of frequent occurrence, and emphasizes the need for early eradication of such a focus. Certain forms of cardiac disease, particularly those of early maturity, are relieved by treatment of coincident cholecystitis or cholelithiasis, and the presence of such heart lesions adds little to the operative or anesthetic risk. Perhaps more commonly present but less frequently stressed are the myocardial heart lesions of older patients, the symptoms of which may at times entirely

obscure the underlying gall-bladder condition. In contradistinction to the heart lesions of youth, these cases carry a definitely increased risk at operation, and most careful attention must be given to pre-operative preparation, choice of anesthetic and rapid technique. In this instance, removal of the infecting organ may produce little change in the cardiac function, as irreparable damage to heart muscle has already taken place.

Coexistence of cholecystitis and appendicitis is of sufficiently frequent occurrence to warrant routine examination of either in the presence of chronic inflammation of the other organ, the connecting link being the lymphatics and chain of glands about the portal vein.

#### MEDICAL TREATMENT

Conservation treatment demands all possible conservation of tissue, but requires early recognition of the infectious process and realization of the danger attendant on its continued presence. It is probable that certain cases of cholecystitis may undergo complete resolution and cure. This is no reason, however, why established infectious tissue producing local disturbance and threatening serious complications should be permitted to continue in the hope of spontaneous recovery. Timely removal of the gall bladder forestalls extensions of infection and permits restoration of normal function, whereas delay may permit progressive changes resulting in permanent and irreparable injury. After a time, no medical or surgical procedure can repair the damage.

Medical treatment aims at the restoration of physiological function of the biliary tract. Several methods are employed and the very multiplicity of remedies suggests the ineffectiveness of any particular one. Diet and medication, aiming to promote more active emptying of the gall bladder, perhaps aided by mechanical biliary-tract drainage by the method of Meltzer and Lyon, and various efforts at actual disinfection of the bile tract, have been

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employed. Two sources of error confuse the record of results by these methods: first, the possibility of error in diagnosis due either to casual examination or to simulation of cholecystitis by gastric or duodenal disease; and second, the undoubted tendency to spontaneous recovery after the removal of a distant primary source of infection in some of the milder cases.

Undoubtedly many patients are improved or cured while under dietetic or medicinal management alone, and occasional spectacular improvement follows the use of duodenal biliary drainage. On the basis of the discovery of the prompt and complete emptying of the gall bladder after a meal of cream and yolk of egg, as described by Boyden, attempts have been made to utilize this action by frequent feedings of meals rich in these substances. Cumulative experience teaches that whatever may be the action on the gall bladder, patients with cholecystitis react poorly to high fat diets. Similarly, the use of repeated doses of magnesium sulphate or sodium phosphate for the same purpose may result in rapid improvement at first, but it produces no sustained effect, other than that which might occur after the use of any laxative. Oleic acid in 10 per cent solution introduced directly into the duodenum causes rapid emptying of the gall bladder, but used by mouth it is too irritating to be of value.

In instances of actual bile infection or catarrhal infection of the mucosa or superficial layers, repeated emptying of the tract, insuring adequate drainage into the intestine, should be of value; and practically it is found that in the two extremes of catarrhal inflammation of the biliary passages and in empyema of the gall bladder, the best clinical results seem to occur by the use of the Meltzer-Lyon method of therapeutic drainage. In one instance of empyema a teacup of thick creamy pus was obtained through a duodenal tube after the instillation of magnesium sulphate solution, and this

was followed by complete return of function as determined by roentgen-ray visualization. It is difficult to understand, however, how such a method can cure an infection of the deep layers of tissue; and when stones are present, as in one-half the cases, it is of no avail.

## SURGICAL TREATMENT

Surgical intervention is indicated by the presence of persistent cholecystitis unrelieved by the removal of distant foci of infection. Before such treatment is instituted it is necessary to consider the general physical condition of the patient as regards the more commonly involved organs, especially the heart. In the event of considerable myocardial involvement, local anesthesia and a procedure of the simplest effective type may be necessary for safety.

Regardless of the kind of operation involved, it is found that a certain number of cases show continued and perhaps undiminished symptoms. Many of these are due to procrastination until such time as permanent organic and functional changes have occurred in neighboring organs, so that removal of the original focus in the gall bladder fails to result in cure. In other instances it is noted that continuation of symptoms occurred in patients whose original complaint was of indefinite dyspepsia and in whom no clean-cut clinical manifestations were present. With increased accuracy in diagnosis better results will obtain from operative treatment.

Cholecystectomy is the operation of choice in cholecystitis when it is not complicated by deep jaundice or other evidence of common-duct obstruction, or pancreatic disease, or when the condition of the patient is such that the more prolonged operation of cholecystectomy would not unduly add to the danger. With these exceptions it may be said that there is little more risk to cholecystectomy than to simple drainage, in experienced hands. Adequate exposure is essential. The

rule of thumb, as in all abdominal incisions, should be to make the incision in the proper plane and long enough to produce the required exposure, and no longer. Healing out of the incision or undercutting at the ends to obtain length without extra scar is in this case inadvisable, as it renders closure difficult and insecure. Rather reverse the process and make the skin incision one-half to one inch longer than the fascial incision.

The position of the patient on the operating table helps materially in obtaining easy access to the region of the gall bladder. If the head of the table is elevated about 30° and a narrow lift or sandbag applied under the costal angle, it will be found that the liver is automatically rotated upward, so that in most cases the gall bladder presents directly on opening the peritoneum. A similar and perhaps more favorable effect may be obtained by angulating a similarly inclined table and omitting the lift. Many operating tables will not, however, permit of this maneuver.

For the purpose of inspection and exploration the simplest and most effective incision is a right rectus incision extending somewhat obliquely outward from a point 2 in. lateral to the ensiform. Through such an incision the area can be inspected and palpated and in most instances this is all that is needed, as the automatic retraction of the liver renders easy the exposure of the fixed portion of the neck of the gall bladder and the junction of the cystic and common ducts. If further room is needed the upper end of the incision can be extended transversely across the medial half of the rectus and the lower end can be extended across the lateral half of the rectus, as recommended by Bevan. The suspensory ligament of the liver may be divided between clamps.

Surgical pathological diagnosis at operation is based on inspection, palpation and aspiration, reinforced by transillumination and sometimes by incision into the gall-bladder wall. The entire tract is exposed to view by retracting the duodenum and

stomach medially and the colon downward with gauze strips. The fundus is readily visible and palpable, and adhesions, subperitoneal fat deposits and calculi in the gall bladder are readily made out. By inserting one or two fingers in the foramen of Winslow, the cystic and part of the common duct may be felt between thumb and fingers and the head of the pancreas may be palpated. If difficulty is encountered in differentiating an enlarged and hardened cystic lymph gland from a stone in the cystic or common duct, a curved transilluminator inserted into the foramen of Winslow with the tip held close to the free edges of the gastrohepatic omentum, will show clearly the outlines of the ducts and the shadow of any stone of perceptible size, whereas an enlarged gland will transmit light without interference. Such visualization of the cystic duct renders more simple the first step of the operation, dissection of the cystic duct from between the layers of the omentum throughout its entire extent, from its origin at the gall bladder to its junction with the common duct. Because of an anomaly in structure, the cystic duct may lie in unusual relation to the common duct and casual ligation may result in damage to the latter. This may be avoided by noting that on the surface of the common duct is a small spiral artery extending throughout its length, and that this is not found on the cystic duct. By using the transilluminator for direct illumination this vessel is readily visible. The cystic duct must be isolated and identified in continuity from its origin at the gall bladder. By careful transillumination and direct illumination anomalies in location of the cystic artery may be made out, and the cystic artery may be ligated with or separately from the cystic duct. A curved hemostat is applied lengthwise to the gall bladder, parallel to its attachment to the liver, and the incision is begun at the lateral side of the lower end of the gall bladder. By sharp and blunt dissection the entire cystic duct, the lower end of the



gall bladder and the cystic artery are exposed almost bloodlessly. An incision is then made through the peritoneal covering, parallel to and  $\frac{3}{8}$  in. from its attachment to the liver, extending proximally to join the previous incision, thus exposing the pedicle. The cystic artery is now doubly ligated, the duct being held by forceps. With a semi-sharp spatula knife the gall bladder is dissected from its bed, beginning above and extending rapidly downward until the gall bladder hangs freely suspended by its duct. The duct is now clamped and divided and the remaining stump is cauterized. The proximal clamp is removed and the common duct is gently probed. Retrograde probing of the hepatic duct, except with the utmost gentleness, is inadvisable because of the danger of impaction of stone in the hepatic duct.

This method is clean and bloodless and permits removal without undue exposure of the divided stump, or danger of contact infection during prolonged manipulation. The dissected peritoneal flaps are closed with a continuous catgut suture leaving a smooth peritonealized surface. With rare ex-

ceptions, temporary drainage is instituted through a small stab wound in the loin, the original incision being closed tight in layers.

In some instances the clinical appearance of the gall bladder at operation fails to confirm the preoperative diagnosis. In such a case it is advisable to check carefully the visible evidences of infection: enlarged cystic lymph glands, radial fibrous striations on the adjacent liver surface, and aspiration of the gall-bladder contents; and if doubt still persists, a v-shaped portion of the gall-bladder wall may be removed from the apex of the fundus to permit direct inspection. It is necessary to remove a portion sufficiently extensive to permit the introduction of a small lamp directly into the cavity of the gall bladder, so that the entire mucosa is visible.

We may say in general that in cases where the visible pathological changes are slight or unrecognizable at operation, but the clinical picture was definite, cholecystectomy may be undertaken with confidence of a satisfactory result. With similar findings, but with symptoms only of vague gastric distress, relief following cholecystectomy may rarely be expected.



### CORONARY THROMBOSIS VS. BILIARY COLIC

Coronary thrombosis is easily confused with biliary colic. Coronary thrombosis occurs more frequently in men than women and is not complicated by jaundice. A careful history often shows that the patient, in the past, is known to have had hypertension and has complained of moderate dyspnea on exertion for some time, or of more or less transitory attacks of pain referred to the precordium or to one or both arms, developing after exertion or sudden emotion and passing off immediately with rest. Biliary colic is more common in women, usually

gives an antecedent history of chronic indigestion with especial difficulty in digesting fatty or greasy foods and such foods as raw apples or onions. There may have been a previous typhoid infection or repeated pregnancies. The onset of the colic is violent, and pain in the epigastrium, rather than a sense of oppression, is the chief symptom. The pain may be referred to the region of the right shoulder blade, the back, mid-epigastrium, chest or even left upper quadrant. Transitory jaundice is frequent.—  
REGINALD FITZ in *Boston M. & S. J.*



# CHOLECYSTECTOMY WITH CYSTIC DUCT DRAINAGE AS A ROUTINE PROCEDURE

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THE controversy raging for so many years between cholecystectomists and cholecystotomists seems to have died down with the conclusion by the majority of surgeons that cholecystectomy is the method of choice. This conclusion has led to a great increase in the number of operations performed, with resulting statistics showing 67 per cent increase in mortality in gall-bladder surgery.

When we consider that cholecystectomy has a lower mortality than cholecystotomy, and that these deaths are not altogether due to incompetent surgery, we must pause and take stock of our method of procedure at the operating table.

Judd and Mann<sup>1</sup> have shown that removal of the gall bladder in animals is always followed by dilatation of the common and the hepatic ducts and that this dilatation occurs immediately after the operation. The surgeon who has performed a large number of cholecystectomies knows that the majority of such operations are followed by severe pain in the upper abdomen referred to the right shoulder, resembling gallstone colic or common duct pain. This pain occasionally lasts only a few minutes but sometimes persists and requires narcotics. Occasionally it will change gradually in character to the typical pain of bile peritonitis: the ligature has slipped, and cut through the duct; the duct has been ligated in torsion; an ulcerating process along the diseased bile tracts has failed to stand the strain; and the patient pays the supreme penalty for the surgeon's failure to institute drainage direct into the bile tract proper.

Ligation of the cystic duct with a cigar-

ette drain placed in its vicinity is incorrect and imperfect and thoroughly unreliable drainage. When the bile ducts begin to dilate after removal of the gall bladder it takes some days before the sphincter of Oddi relaxes. The necessity for continuous bile flow is obvious. Back pressure of bile equal to 120 mm. of water will stop the liver function and result in disaster. Rupture of the gall bladder rarely occurs and only in those cases where the cystic duct is blocked. Blocking of the common duct never causes rupture of the gall bladder. The presence of infection in the lymphatics surrounding the gall bladder and bile ducts, and traversing the liver, is another factor that must be brought into consideration in devising a rational procedure for cholecystectomy.

With these factors in mind we began making a study of how this could best be accomplished, and concluded that the method described here is the best in our hands.

The gall bladder is exposed through the operator's incision of choice. We prefer the transverse incision but occasionally use the incision placed close to the midline. The fundus of the gall bladder is then caught in a sponge forceps. Slight traction is exerted, which will cause the patient to contract the diaphragm, thus forcing the liver and gall bladder downward. The gall bladder presents into the wound in the majority of cases without any excessive traction. About 45 c.c. of 0.75 per cent novocaine are then injected between the gall bladder and liver and along the common duct. If more than ordinary tension has to be exerted, a splanchnic block on the

right side is then made by injecting 60 c.c. just to the right of the second lumbar vertebra into the retroperitoneal space. The peritoneal covering of the gall bladder is opened at a point 1.5 c.c. from the margin of the liver. Curved scissors are placed beneath the peritoneum and the peritoneal covering is stripped from the gall bladder following a line corresponding to the transverse circumference of the gall bladder at this point (Fig. 1). The stripping of the peritoneum from the gall bladder is

be used not to handle stones roughly, for traumatization of the common duct will frequently result in stricture. Local anesthesia is a great factor in protecting the patient. The rough technician cannot work under local anesthesia. If much handling is going to be required it is better to open the duct and take out the stones. The transduodenal route is permissible, but not advisable. Speed is not a factor. The surgeon with limited time should not do gall-bladder work. Speed and general

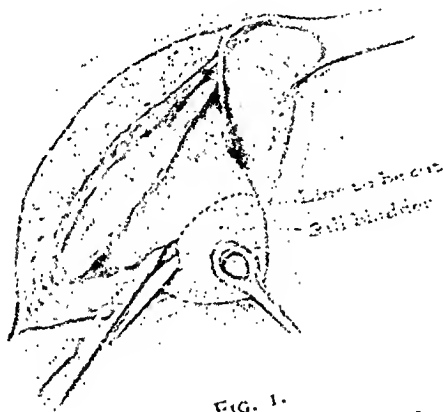


FIG. 1.

continued down to the cystic duct. The peritoneal coat is grasped at three or four points and all traction required is put on this tissue. The dissection is continued downward, separating the peritoneum from the cystic and common ducts and occasionally ligating a small vessel. This is very easily accomplished and no vessels of any size are damaged. A right-angle clamp is placed about one inch from the common duct. The cystic duct is grasped on either side so that the lumen will not be occluded and the duct is cut off proximal to the clamp, the clamp being left on the gall bladder. The cystic duct is open and if there is no stricture a few drops of bile will flow back into the peritoneal pouch. If stones are present, the common duct can be opened by splitting down the cystic, but this is seldom required. Most of these stones, even though they be in the common duct, can be scooped out or milked backward through the cystic duct. Care should

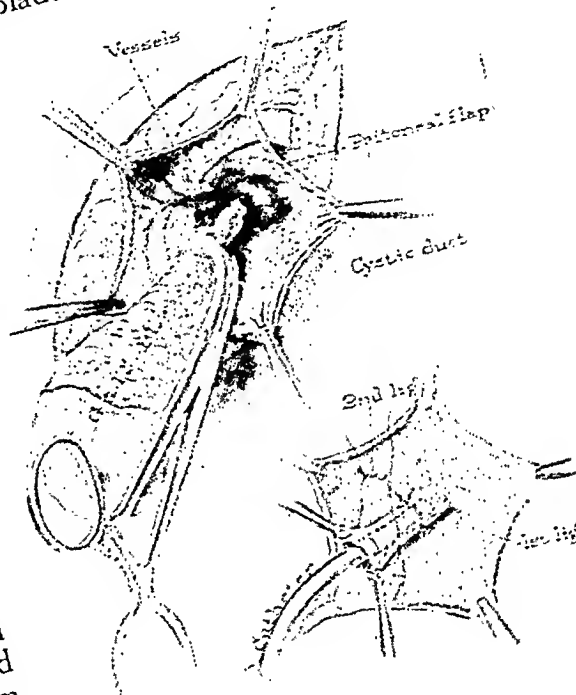


FIG. 2.

anesthetics are probably contributing considerably to the 67 per cent increase in mortality.

A No. 20 F. catheter with the tip cut off is placed in the cystic duct. This is pushed down to within a centimeter of the common duct and ligated in position, with the first ligature placed near the common duct (Fig. 2). A second ligature is placed about 3/4 in. above the first ligature. The peritoneal coat that has been acting as a sack in which the operation is performed, thus protecting the peritoneal cavity from soiling, is now gathered in a purse-string and

the third ligature is tied firmly around the catheter. The abdomen is closed without further drainage, care being exercised that the catheter is pushed well down so that any movement, vomiting, coughing, or tossing in bed will not put a strain on the delicate structures of the liver. The catheter is not clamped. Any bile that accumulates is allowed to flow out, and this is usually flowing freely at the end of the operation. If a clamp is placed on the catheter the patient will complain of severe pain referred to the right shoulder and the object for which the operation was performed will be defeated, namely, the providing of an outlet for bile until the sphincter of Oddi is relaxed by the continuous flow of bile into the intestine. When this has been accomplished, usually within about four days, no more bile comes through the catheter, which ordinarily comes out spontaneously on the sixth day. The wound heals by first intention, and there is no further bile drainage.

We have performed this operation on 44 cases. We advocate it only in chronic cases. In this series of 44 cases, the average time spent in the hospital was eleven days. The average time of bile drainage was five days. No narcotic was used in any case after the first night. The postoperative course of these cases is far superior to those done in the ordinary manner. Further analysis of these cases shows that 43 have been completely relieved of symptoms and 1 partially relieved. The catheter slipped out of the cystic duct in one case, on the second day, and bile drained for four days with no bad result. Ten patients vomited once after morphine, one case severely. In three cases of severe pain, including the postoperative vomiting case, there was no drainage of bile. The fact that no bile drainage occurred and that these three patients presented the average picture of cholecystectomy without cystic duct drainage is a strong indication for this procedure. Forty-two of the 44 cases were done under local anesthesia. The two operations under general anesthesia were done at the

request of the patients, both of whom were extremely neurotic and poor subjects for local anesthesia. In the case in which the tube slipped out after twenty-four hours there were no disagreeable symptoms but bile continued to drain for three days thereafter.

In many of these cases other operations were performed at the same time. Thirty had appendicectomies; 4, appendectomy and bilateral salpingectomy; 1, appendectomy, salpingectomy and perineorrhaphy, and in 1 case the gall bladder, appendix and tubes were removed and an umbilical hernia, cystocele and rectocele were repaired. In another case, appendectomy and bilateral salpingectomy were done and a ventral and right inguinal hernia, cystocele and rectocele were repaired. Nineteen had stones; 4 of them in the common and cystic ducts and 8 in the cystic duct alone.

This operation should be done under local anesthesia, as the deep breathing and movement of the diaphragm under general anesthesia causes considerable difficulty, especially when the dissection has progressed to the vicinity of the common duct.

The advantages of the operation are numerous: (1) it removes the gall bladder; (2) it permits drainage; (3) it opens up the lymphatics surrounding the bile ducts, where most of the pathological process in gall-bladder disease originates, and provides drainage for them; (4) it prevents dilatation of the common and hepatic ducts; (5) it permits drainage of bile so that the liver function is not interfered with by back pressure; (6) it eliminates the danger of death from "blowing off" or cutting through of a ligature, ulceration, etc.; (7) it prevents death from bile leakage; (8) it shortens the operative stay in the hospital; (9) it gives a more comfortable postoperative period; (10) no raw surfaces are left to form adhesions; (11) it reduces to a minimum the operative accidents due to anatomical anomalies of the cystic artery, cystic, common, hepatic and pancreatic ducts; (12) it eliminates

the danger of injury to the portal vein such as has happened in a wild scramble to recover a cut cystic artery. In this operation the cystic artery is not cut and not ligated. Occasionally, however, one of its branches is found large enough to require ligation.

Ochsner<sup>2</sup> described a somewhat similar operation in 1906. None of the other methods of cystic duct drainage we have

employed on dogs has proven satisfactory in our hands, while this method has, so we have decided to use it as a routine on human cases.

#### REFERENCES

1. Judd, E. S., and MANN, F. C. The effect of removal of the gall bladder. *Surge., Gynec. & Obst.*, 1917, xxiv, 437-442.
2. OCHSNER, A. J. The technique of gall-bladder operations. *Surge., Gynec. & Obst.*, 1906, ii, 204-208.

### “HIGH” AND “LOW” OPERATION FOR FEMORAL HERNIA

That the removal of the sac is absolutely insufficient to cure a hernia was definitely shown by Professor Gask, who a few years ago treated 10 cases of femoral hernia by laparotomy with complete removal of the sac from within the peritoneal cavity. In 6 of these cases the hernia promptly recurred, and this method of treatment had to be abandoned.

Keynes goes on to say that the so-called “low operation” is also, in his opinion, unsatisfactory and should no longer be used. He states that in this operation a vertical incision is made in Scarpa's triangle, which usually results in a very ugly scar. The hernial sac is then isolated and ligatured as it emerges from the saphenous opening. Finally, the inguinal ligament is sutured to Cooper's ligament, or a purse-string suture is used in an attempt to close the external canal. The complete removal of the sac by this means is almost impossible for anatomical reasons; neither can it be supposed that an approximation of two tense structures, such as the inguinal ligament and the pectineal fascia, or the ligament of Astley Cooper, can be permanently maintained. That many patients treated by this method have been cured cannot be denied, for often the aperture through which the sac emerges is narrow, and a film of scar tissue is efficient in closing it; but as a routine procedure Keynes believes it theoretically unsound, and the recurrences he has seen confirm this view in practice. Keynes admits that the inguinal operation is admittedly a more intricate procedure and demands accurate knowledge of the anatomy.

As a strong advocate of the so-called low operation for femoral hernia for many years, I must beg to differ strongly from Keynes' opinion.

The statement that “The complete removal of the sac by this operation is almost impossible for anatomical reasons” is entirely at variance with my own experience. The proper incision for this operation is not a vertical one, but is made directly over and parallel with Poupart's ligament, and has been employed by me for thirty-five years. It practically always leaves but a fine linear scar which can scarcely be recognized even on closest inspection. If the sac is carefully dissected from the femoral ring and pulled down, as is possible in practically all cases, even should adherent omentum be present, it can be and should be tied off sufficiently high, so that when the stump is pushed into the abdominal cavity there is then no trace whatever of a pouching process left behind. Concerning the supposed inability to approximate the two tense structures, the inguinal ligament and the pectineal fascia, I would state that in actual practice these two structures can be brought together with a purse-string suture with very little tension. In proof of the fact that this union remains permanent, I will cite the end-results of cases treated by this method from 1891 to 1906, during which period I performed 117 operations for femoral hernia in 105 patients, with only 1 slight recurrence.

The advocates of the “high operation” up to the present time have never given as large a series of cases, carefully followed up for any such length of time, as our own, and until such a group of carefully traced cases over a long period of time is submitted, showing superior results to our own, we believe it wise to adhere to the old low operation, which is far simpler and much more easily performed.—WM. B. COLEY in *Progressive Medicine*.

# INTENSIVE METHODS OF APPLYING HEAT FOR RELIEF OF PAIN

## AND OTHER THERAPEUTIC EFFECTS\*

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THE use of heat as a means of relieving pain is one of the oldest therapeutic measures. Even animals seem to be guided by instinct to resort to this simple physical agent when suffering pain. A dog suffering from earache puts his warm paw against his ear, a baby with earache places its hand to its ear and similarly, a person suffering with abdominal pain involuntarily bends his body forward and draws his thighs upward. Primitive people of all countries from the Arctics to the South Sea Islands treat rheumatism by hot vapor or steam baths administered in various ingenious ways. The Finlander shuts himself in a small room and creates steam by pouring water on hot stones. The Maoris of New Zealand heat stones in a pit and cover them with palm leaves on which the patient lies down, and a mat is covered over all.

Just how heat relieves pain is perhaps not fully understood. It probably acts in several ways, sometimes by diverting blood from congested parts through the production of a collateral hyperemia, and sometimes, perhaps, by accelerating blood movement and so relieving a vascular stasis. But almost magical effects in relieving pain are often produced by hot applications under conditions in which neither of these explanations seems adequate to account for the results obtained. In some way not clearly explicable heat lessens nerve sensibility and abolishes pain. It has been suggested that this thermic effect is the result of inhibition acting through the temperature nerves of the skin.

Whatever may be the explanation, we know that heat, properly applied, kills

pain. This remarkable quality seems to be one of the specific properties of heat which it always possesses, no matter what its origin. Heat waves of all lengths produce pain-relieving effects, but the luminous heat waves and the shorter infra-red rays found in the upper region of the infra-red section of the spectrum appear to be the most effective, doubtless because of their greater penetrative power.

It is not my intention to describe apparatus here, but I think it worth while to call attention to the fact that special apparatus for the application of infra-red rays is not needed, for the reason that these rays are always present in abundant quantity. Long infra-red rays are available in any quantity desired through such commonly employed means of making heat applications as the fomentation, the hot poultice, hot water bag, hot sand bags, heated stones or bricks, etc., and the shorter and more penetrating infra-red and luminous heat rays are always present in the radiation from arc and incandescent lamps of every sort. Even the glowing coals of an open fireplace are a most effective source of heat rays of the very highest therapeutic value.

The one point which it is the purpose of this paper to impress is the fact that for efficient and definite effects, a certain and rather high degree of intensity is required.

The specific effect of heat upon nerve sensibility is shown in its effect upon the tactile sense. Beginning with 113°F., tactile sensibility is steadily diminished as the temperature rises, until at 130°F. it disappears entirely; the application at this point becomes painful. Every person who has had any considerable experience in

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the use of heat for relief of pain has learned by observation that for decided effects the applications must be very hot, as hot as the patient is able to bear. Applications of lower temperature may give some relief and afford the patient considerable comfort, but to conquer the pain the application must be hot enough to produce on first contact with the skin a slightly painful sensation. In applying a fomentation a well-trained attendant makes the cloth so hot that it is necessary to lift it from the skin for a few seconds almost immediately after the application is made, or to pass the hand underneath next the skin so as to admit air and permit slight cooling of the surface by evaporation. After the compress has cooled a little so that the heat becomes easily tolerable, it is usually left in place for four or five minutes and then renewed two or three times. The chief benefit that a patient derives from such an application is due to the intense heat effect experienced for the first half-minute or minute at the beginning of each application; thus the total duration of the effective part of the application may not be more than two or three minutes, although the time occupied by the whole treatment may have been fifteen minutes or more. Attendants should be instructed in the application of the fomentation to make the changes rapidly, at least once a minute, continuing for fifteen or twenty minutes. As the skin becomes more tolerant to heat the temperature of the compress should be gradually increased until the maximum temperature that the skin will tolerate is reached. I have often seen very severe and obstinate pains relieved when this intensive method was employed, even when hot compresses applied in the usual way had proved entirely ineffectual.

There are various other effective methods of applying water intensively. One of the most useful of these is the intensive hot hand bath. A suitable vessel, which may be a washbowl, is filled with water having a temperature of not less than 120°F. At this temperature the hands cannot be held

in the water for any great length of time, but they may be rapidly dipped in a number of times. At first it may not be possible to hold the hands in the water for more than one or two seconds before withdrawing. After allowing the surface to cool in the air while rubbing the hands for two or three seconds, dip in the water again and so continue alternately dipping and cooling until the desired effect is obtained. Twenty-five or thirty dips will usually suffice to relieve the misery of painful rheumatic finger joints. Tenderness of the joints will also be lessened. A good plan is to have the patient count at the rate of two counts to the second. Beginning when the hands are placed in the water, count 1, 2, 3, 4, 5. The water should be so hot that it will be impossible to keep the hands longer immersed. After lifting from the water count 5, then dip again, and so continue. As the hands become a little more accustomed to the heat the number of counts with the hands in the water may be increased to 10 or even more, but the time out of the water need not be increased. Patients suffering from rheumatic finger joints may with great profit employ the intensive hand bath three or four times a day. Care should be taken to avoid chilling the hands by exposure to cold air after a hot bath. If the hands should become cold they should as soon as possible be given a hot bath, after which vaseline or cold cream should be applied and the fingers protected by warm gloves or other sufficient means.

The intensive hot bath of the foot is equally valuable for rheumatic feet. The temperature of the foot bath at the beginning should be about 105°F. It should be rapidly raised to about 110°F. and after a minute or two more water should be added so as to raise the temperature to 115°F. The feet should be repeatedly placed in the water and lifted out, with counting, as described for the intensive hand bath.

The intensive hot foot bath is an excellent means of relieving pelvic pain as well as pain in the feet. The use of the hot foot



bath for relief of dysmenorrhea is a common practice of the laity in many parts of the country. Applied by the intensive method, the efficiency of the foot bath will be found greatly increased. For nearly forty years I have made use of the hot foot bath as a means of relieving pain after abdominal operations involving the pelvic viscera and with such good effects that in hundreds of cases of this sort I found it unnecessary to employ anodynes of any sort either immediately after the operation or at any time during the postoperative care of the patient. Patients suffer so much less from constipation, loss of appetite, nervousness, intestinal gas and other conditions commonly experienced by surgical cases of this sort, that I feel fully justified in urging more frequent use of the foot bath and other means of applying heat in the postoperative care of surgical cases instead of the hypodermic injections of morphia and other anodyne medication now commonly employed.

The late Dr. Lawson Tait, of Birmingham, England, with whom I spent a few months very profitably as a student assistant nearly forty years ago, never gave his patients any sort of pain-relieving medicine. He said to me one day, "I never give drugs of any sort to relieve pain unless I am sure the patient is going to die." Dr. Tait attributed his unusual success in abdominal operations (he had a record of 116 successive abdominal operations without a death) very largely to the fact that he withheld anodynes and encouraged intestinal activity both before and after operating. His patients often suffered greatly and sometimes made quite a bedlam of his wards with their screams and groans, and it was this experience which suggested to me the use of the hot foot bath and other hot applications in this class of cases. The comfort afforded the patient proved to be so valuable a factor in connection with other allied measures that I was able to improve even Dr. Tait's record, quite unusual for that time, prior to the introduction of rubber gloves, by extending the

list of successive laparotomy recoveries to 165.

Another intensive method of applying heat that I have found most useful in a very distressing class of patients is the hot affusion. This bath is adapted to the relief of superficial sensory disturbances, especially the intolerable itching of urticaria and the burning and itching of eczema and other irritable skin disorders. The method consists in laving the affected parts with very hot water. Care must be taken not to pour the water upon the skin in a continuous stream as the temperature that must be employed is so great that a severe burn would be produced. The temperature of the water should be 120° to 130°F. Even hotter water may be employed if great care is exercised.

The best method of making the application is to extend the affected part, say a hand or an arm, over the edge of a bath tub partly filled with water of the proper temperature. With a basin the water is dipped and projected in such a way that it spreads out in a thin layer and descends upon the affected surface by the force of gravity. When applied in this way, the water, no matter what its temperature, retains its heat for so short a time that the skin is not burned although a very intense sensation of heat is produced. When deftly managed, this method of applying heat is wonderfully effective in relieving most intolerable itching and burning no matter how severe or what the cause.

Applications may be made to the back by allowing the patient to sit over the edge of the tub. Parts that cannot be reached in this way may be treated by means of napkins dipped in hot water and applied to the skin by brief touchings, care being taken not to maintain the contact long enough to produce blistering.

The effect of a thermic application of this sort is so certain and prompt as to seem almost like magic and the relief afforded usually continues for several hours. With proper care to protect the skin with suitable emollients after treat-



ments of this sort, the applications usually prove to be not only palliative but curative.

In general, the most convenient and efficient means of applying heat therapeutically, either general or local, is the incandescent lamp, in which the source of radiant energy is an incandescent filament. Heat rays from such a source have a remarkably penetrative power. It was the discovery of this fact in 1891 that led me to the construction of the photophore for local use and the electric light bath cabinet for general applications of heat. The discovery was quite accidental. In turning on a side-light one evening, my hand, while close to the lamp, came between my eyes and the filament and I noticed a red glow through the fingers, which suggested to me at once that the incandescent light was a new and superior means of applying heat to the body because of its power of penetration. I at once constructed various forms of thermophores consisting of one or more incandescent lamps mounted with a metallic reflector, and shortly after had constructed various types of cabinets in which thirty to fifty incandescent lights were employed. In one type of cabinet the source of heat was four arc lights, one in each corner.

I soon discovered that the overheating of the skin surface was a distinct obstacle in the way of securing the highest degree of efficiency for the reason that it prevented the use of a sufficient volume of heat to influence strongly the deeper tissues. I endeavored to overcome this difficulty in various ways. One plan was the combination of a shower bath with the electric light bath. Such a combination permitted the use of a much larger volume of heat than can be employed in the ordinary cabinet. In the use of the thermophore for local applications of heat it was found possible greatly to increase the intensity of the application by keeping the surface moist, passing over it a cloth or a sponge saturated with cool or tepid water at frequent intervals. The evaporation thus promoted kept the superficial layers of the skin cool without

obstructing the more penetrating heat rays.

#### AIR-COOLED APPLICATIONS OF RADIANT HEAT

By experiment I found that the same effects could be produced by directing upon the treated surface a current of air, and I have employed this method ever since. The intensity of a hot application may be greatly increased by combining with it some means of simultaneously cooling the skin surface. This method requires the use of some suitable source of radiant heat. Either an arc light, the incandescent lamp or a heating element may be used. A small electric fan will supply the air current. With a current of air falling upon the heated surface the intensity of the light applications may be doubled. This means that the tissues beneath the skin surface are receiving twice as large quantities of radiant energy as they could receive without the protective cooling of the skin surface. By this means quantities of heat may be applied that would be absolutely intolerant to the skin and would produce structural injury if long continued, and this without the slightest injury to the skin tissues or any interference with the passage of the penetrating heat rays to the deeper structures.

From the facts already stated, it must be evident that cooling of the skin surface during an application of radiant heat is a matter of great practical importance. This is clearly shown by clinical experience. Cases in which no relief is obtained by ordinary hot applications readily yield to the massive doses of radiant energy that become permissible by this method. By moistening the surface from time to time so as to maintain evaporation in connection with the air current, the surface may be so effectually cooled that the doses may be still further increased to three or four times the amount tolerable without the surface cooling. This method is especially applicable to cases of deep-seated neuralgia, such as chronic sciatica, rheumatic joints, and certain cases of visceral disease.

## INTERMITTENT HOT APPLICATIONS

When it is desired to produce revulsive effects, the end desired may be readily attained by a slight modification of the method just described. By the use of a swinging electric fan the air current, instead of being continuous, will be interrupted at regular intervals. The light should be placed at such a distance from the skin that during the interruption of the air current the temperature will rise to the point of greatest tolerance. When the swing of the fan again causes the current to play upon the heated surface cooling will occur, to be followed by a quick rise as soon as the swing of the fan carries it out of range. The periods of heating and cooling may be doubled by placing the fan at right angles with the light and in such a position that when the side facing the patient is swung to the extreme limit the air current will still be felt. When this is done the patient receives the current while the fan is both going and coming or for the time required for one complete swing.

Another method for intermittent heating is by turning the current on or off at such intervals as may be desired. The switch controlling the current may be placed in the hands of the patient, who will regulate the duration of the application by counting. The heat should be so great that it can be tolerated only for a time not greater than that required for counting ten

at a moderately rapid rate, say two counts to the second. Perhaps at first the point of tolerance may be reached at the end of five counts. When the switch is turned off the patient counts ten while the skin is cool, then turns the current on and repeats the counting.

Instead of turning the current off and on by hand a mechanical or automatic interrupter may be employed. All of these different methods I have employed but on the whole I find nothing better than the combination of the ordinary thermophore, such as the Battle Creek Jr. Deep Therapy Lamp combined with the ordinary simple electric fan.

The suggestions offered in this brief paper may seem to be so simple that they are hardly worth considering; but I am sure that any practical clinician who will make a trial of the intensive methods described as means of relieving pain will find them so efficient that he will soon discover that he is making use of morphia and other anodyne drugs much less frequently than was previously thought necessary, and I am sure most of my medical colleagues will agree that anything that will tend directly or indirectly to lessen the use of these powerful narcotics, to which patients so quickly become habituated and enslaved, is worthy of serious consideration, and a fair test in practical experience.



# PRIMARY REPAIR OF LACERATED TENDONS AND NERVES\*

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IN the following presentation no originality of treatment is assumed. Several principles and practices of standard surgical procedures have, however, been combined with slight modifications, thereby increasing the efficiency of the primary repair of lacerations of tendons and nerves. Only the normal severed tendon and nerve are considered.

Although primary suture of a tendon or nerve is regarded as minor surgery, a great number of unsatisfactory results have been observed at the various return clinics and industrial compensation hearings. There are several reasons for this. In many cases one or more divided tendons have been actually overlooked in repair; in some instances tendons have been properly sutured, but severance of a nerve was not discovered. Faulty alignment, as a fascial covering sutured to a tendon, scar and tendon contracture, are other causes of poor end-results.

The technique and observations here presented are based upon 85 cases admitted to Harlem Hospital, and final observations upon 58 of these cases at a follow-up clinic, as well as upon animal experimentation.

Primary repair of tendons and nerves means a reestablishment of continuity within a limited period of time after injury, in contradistinction to secondary repair, which is done at some subsequent time, because of either some complication at the time of injury or an incomplete primary repair.

Severance of tendons and nerves is most frequently found in the hands and forearms, because the hands and forearms are exposed most frequently in industrial work, or used as a defensive or offensive

mechanism in an altercation. The injury is usually produced by a cutting object such as a knife, sharp piece of steel, glass, by the crushing or mangling of a part caught in machinery, or by an explosion. The sharp type of agent involves the tendons, nerves and blood vessels, whereas the crushing type of injury involves bone in addition to the soft parts.

The laceration of the tendon or nerve may be complete or incomplete; the tendon or nerve may also be clean-cut, crushed or frayed, depending on the type of injury. In multiple lacerations a tendon or nerve may be severed at two levels. The incomplete division of a tendon or nerve is very important and most difficult to recognize, as there is little or no loss of function. The prognosis, therefore, of all wounds should be guarded until thoroughly examined. Severance of a tendon or nerve, or both, should be suspected in all wounds. The function of each structure in the neighborhood of the wound should be thoroughly tested. This is more important in the stab or puncture wounds, where a small skin laceration is present and a great deal of trauma to both tendons and nerves may exist.

The involved member should be placed at rest immediately by means of a temporary splint, until operative repair is instituted. A prophylactic injection of tetanus antitoxin is given when the patient is first seen. Primary hemorrhage is controlled by suture, ligature or packing. A tourniquet may be employed to control bleeding if operation can be performed at once. The amount of injury to the circulation can be very severe without appreciable effect on the prognosis; this is most apparent in the

\* From the Surgical Service of Harlem Hospital and the Department of Experimental Surgery, New York University and Bellevue Hospital Medical College. Read before the Clinical Society of the Hospital for Joint Diseases, March 22, 1927.

hand and foot, where collateral circulation is ample. Both radial and ulnar arteries were cut in three cases of this series.

A primary repair is indicated as soon as possible, unless there are contraindications such as shock, or severe avulsions with fracture, where life or limb is in danger and the tendon and nerve repair becomes a matter of secondary importance. If it is evident that numerous tendons are cut, with nerve involvement, a general anesthetic is employed. The wound should be thoroughly cleansed with sterile soap and water, followed by ether. The involved extremity is shaved; in industrial accidents or machinery wounds, where there is considerable soiling with grease, the soft parts are given preliminary cleansing with benzine. The cleansing programme should include the adjacent skin far and wide, and as much care and attention should be paid to this preliminary cleansing of the wound as to the subsequent operative detail. "Too much" soap and water and ether should be used. After drying the part, paint with tincture of iodine, pouring some into the wound. All devitalized tissue should be removed. A primary union can be obtained in most wounds if they are seen early and treated this way. Never attempt repair if the wound is obviously or potentially infected.

The divided ends of the tendon are sometimes to be seen in the superficial wound immediately following the injury, though usually retraction of the tendon occurs almost simultaneously with the injury, the proximal end retracting the most. The amount of retraction varies with the length of time after the trauma, and the muscular action the part is subjected to, following the infliction of the wound. At times it is possible to isolate the divided tendon ends in the original wound; careful and proper instrumental retraction will aid greatly in this respect. Flexing and extending the part is of service at times. Often a forceps can be inserted into the tendon sheath and the severed end pulled down. If the cut ends are not isolated by these simple pro-

cedures, or it is evident that many tendons are cut, enlarge the wound by an incision which bisects the original wound. Most of these wounds, especially the one produced by a knife, run transversely. There is no reason to hesitate in widely exposing the wound so that the tendons can be quickly identified.

The annular ligament can be sacrificed with impunity if necessary. No attempt should be made primarily to identify the individual tendons. When the tendons are

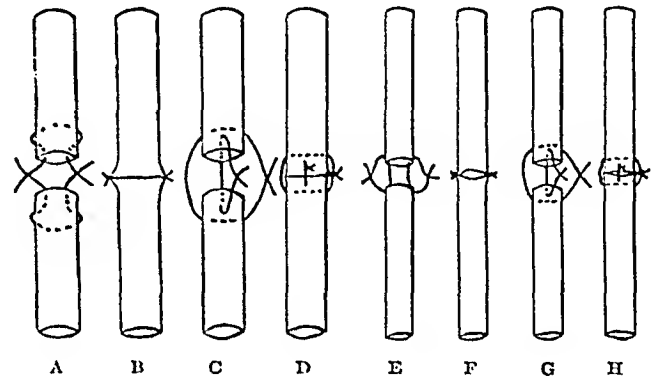


FIG. 1.

isolated, all their cut ends should be grasped gently with an Allis clamp to avoid further crushing and injury of the already contused tendons. Sutures should be employed immediately and they can be used for identification and traction. After careful inspection of the wound, and after the proximal and distal cut ends of the tendons have been identified, they should be carefully matched, but not before.

Avoid all unnecessary trauma to the tendon and nerve and a too long exposure; moisten the part from time to time with normal salt solution. A straight needle, flattened on both sides and with a calyx type of eye, will traumatize the tendon very little; intestinal needles are very satisfactory. Close the tendon sheath with fine chromicized catgut when possible. All structures, such as connecting bands and ligaments, and especially the annular ligament, traumatized at the time of injury or at operation, should be repaired. These structures may be sutured with No. 00 chromicized catgut. The skin is closed with

interrupted silkworm-gut stitches. Insert a rubber tissue drain for twenty-four hours. Cosmetic closing of the wound, should never be attempted. A few stitches to coaptate the skin are all that is necessary; this allows drainage and furthermore prevents traumatic lymphatic edema. A further devitalization of skin is minimized. Splint the part in a position of rest and relaxation.

The choice of suture material, that is, of absorbable or non-absorbable material, must rest with the operator. Both materials were employed in these cases. Silk has the advantage of holding in the presence of infection; chromicized catgut traumatizes the tendon a little more than silk on insertion of the suture. That non-absorbable material can be safely left in the tissues, and especially the tendons, is demonstrated in the work done in infantile paralysis. During the "holding" period of the suture both are foreign bodies, and if no infection occurs nature will take care of the silk as it does of chromicized catgut. The main object is to maintain the cut ends in apposition until a scar of sufficient strength is formed. The resultant scar is the factor that will bear the burden of the repair, and not the suture material. Therefore, either absorbable or non-absorbable material can be used, depending upon the personal factor.

Regeneration takes place by a formation of scar tissue. There is a proliferation of the cells of the tendons, the tendon sheaths and the surrounding connective tissue. These cells infiltrate the blood clots which form between the cut ends of the tendon and form a scar, which is either new tendon tissue or a tissue that cannot be differentiated from tendon tissue.

In this series of cases No. 00 chromicized catgut and No. 2 silk were used as suture material. This is threaded with a needle at each end. One needle is passed through the tendon transversely; it is then passed into the axis of the tendon. The second needle is passed as the first, in the long axis of tendon. When tied the cut ends have a slight mushrooming effect (Fig. 1. A, B). This is a modification of the Bunnell suture.

The Friedrich suture is also very satisfactory; here the first suture is passed transversely through both cut ends of the tendon. This is tied, and then a second suture is passed parallel to the long axis of the tendon and tied. The second suture reinforces suture number one. (Fig. 1. C, D.)

Experimentally, various tendons were severed and immediately sutured with silk or 00 chromicized catgut. Twenty days later the suture line was removed and prepared for microscopic examination. In both types of suture, at the end of this period, round cell infiltration was present with increased vascularity. Microscopically there was little or no difference between the sutures used. The chromicized catgut was absorbed. In some of the slides there apparently were more signs of chronic inflammation with the silk suture.

In other animals an inch of tendon was removed and the two ends united. In this series of cases at the end of twenty days a firm union was found. On section, round cell infiltration and increased vascularity were more marked than in those cases where the tendon was just severed and sutured.

If infection takes place, only the skin sutures should be removed, and the proper means taken to combat this infection. In the cases reported, the wounds were treated by the Carrel-Dakin method. The sutures holding the tendons are not removed, and even in the presence of infection active motion should be continued and insisted upon. Although the tendon is rather resistant to infection a supportive apparatus is used until the infection is controlled. Early limited motion in the supportive apparatus, forty-eight hours after operation, has met with no deleterious result. This slight motion, if the tendon has been properly coaptated, does no harm, and at the same time prevents adhesions between the scar and the tendon. Increased guarded active motion may be started within one week, and should be practised several times each day. Full excursion of the part to its normal physiological limits should

not be attempted until at least two weeks; during these two weeks the new-formed scar is very weak, and too energetic motion will cause its rupture. If motion is delayed longer, however, the first complication of tendon suture arises, the development of adhesions between the scar and the tendon. Within ten to fifteen days the supportive apparatus is discarded.

In the crushing type of injury the return to normal function is materially delayed by the so-called traumatic edema, a lymph stasis distal to the wound. This has been one of the most distressing complications and most difficult to relieve. In this class of injury physical therapy finds a great field of usefulness. After all wounds are healed, the use of active and passive motion, with massage and physical agents of therapy causes a rapid return to normal. The continued use of an injured part will restore it to normal function far better than any other form of treatment.

In the repair of a lacerated nerve the same general surgical considerations are applicable to the preoperative, operative and postoperative care as in tendon work. To avoid repetition, only those points that are peculiar to peripheral nerve repair will be mentioned.

As a result of the same forces of violence causing division of tendons, a disturbance in the power of conduction of the peripheral nerves may occur. This interference may concern motion, sensation, reflexes and trophic influences. The amount of disturbance and the variations are dependent upon the degree and the location of injury to the nerve. Complete division is followed by severe, prolonged or even permanent loss of function. Only a partial or complete division of the peripheral nerve associated with wounds and complicating division of tendons are here considered. The character of the nerve wound is similar to that described for wounds of the soft tissue. In this series the nerve wounds were of the incised type, due to violence as the result of some sharp instrument.

The symptoms of nerve injury are

indicated by loss of function and develop shortly after injury. The symptoms are both motor and sensory, and are followed later by muscle atrophy, with degeneration and fibrosing, vasomotor and trophic disturbances of the part. Nerve function should always be tested, even if the evidence points to lacerated tendons only.

Despite the careful technique of nerve suture described in various textbooks and journals, the important fact is to suture the substance of the cut ends of the nerve and not attempt theoretically to suture the fine covering of the nerve structure. (Fig. 1. E, F.) The failure of the nerve suture in many instances has probably been because a good bite of the contiguous surfaces of the nerve has not been secured.

In experiments it has been shown that if the cut ends of the nerve are brought in direct contact the resulting neuroma is of small size and the increase of new nerve fibrils is not so great. By allowing this dead nerve space to be increased in size, the new nerve fibrils become more numerous and many curl up upon themselves and there is a greater deposition of fibrous tissue in the neuroma. In this connection Delagenière<sup>1</sup> states: "If in the case of a nerve section, the two ends are in contact or are separated by a very short space, the regeneration can occur normally, but if the two ends are too far separated, or if there exists between the two ends space that cannot be bridged, regeneration cannot occur."

The suture employed in this series of cases is the Friedrich type used in the repair of tendons (Fig. 1. G, H). If this suture fails, the result at least provides impediment to retraction, so that the secondary operation can be executed with less difficulty. The ends of the nerve are freshened by a razor blade, not by scissors, for the latter crushes the fine nerve fibrils. Very careful approximation of the cut ends of the nerve should be obtained, as it aids in hastening regeneration. Experimentally, as in tendon suture, microscopic examination of a sutured nerve after twenty days does not show much difference in tissue

reaction in those animals in which silk or chromicized catgut was employed.<sup>2</sup> The use of adipose tissue, fascial or vein coverings over the suture line has not been found of sufficient value to continue it in primary suture.

The degree and rapidity of regeneration depend on the amount of injury to the nerve, the nerve power of regeneration and the local condition present, that is, the more distant from the nucleus of origin, the quicker the recovery. There is only slight retraction of the cut ends. Degeneration takes place immediately at the site of injury, and this is followed by secondary degeneration, both peripheral and central to the injury, less marked toward the central end. Sensory portions of the nerves regenerate much faster than the motor fibers. Regeneration is more apt to occur in a purely motor or purely sensory than in the mixed type.

Rapid and early regeneration or nerve repair is favored by incomplete severance, the immediate accurate apposition of the divided ends, and the absence of infection. Nerve regeneration is retarded or prevented by poor apposition of the cut ends, the destruction of a segment of nerve, the interposition of tissue or foreign body between the cut ends, or the development of scar tissue between the ends. In several cases of nerve injury in this series the interpretation of nerve union: trophic, sensory and motor disturbances, are not in accord with the regeneration of nerves in general. The beginning return of sensation has been noticed within three days to three weeks, which is contrary to the accepted theories of nerve regeneration. The atrophies of the interossei, abductors and adductors, thenar and hypothenar muscles, etc., require a much longer time. Twelve months at least should elapse before a secondary repair of nerve be undertaken. It is a known fact that nerve tissue has very little regenerative power, and it cannot be said that repair and restoration of function will occur, even if all conditions favorable for repair are present.

The phenomenon of the return of sensation in severed peripheral nerves has been observed too many times to make it one of coincidence; up to the present there is no definite explanation. Experimental work is being done, as well as careful neurological examinations, to try to explain these peculiar findings contrary to our knowledge of nerve regeneration and healing.

Head<sup>3</sup> says: "Generations of anatomists have studied the course and distribution of the peripheral nerves, until knowledge of their more obvious features has apparently reached finality. It is recognized that more can be learnt of their central connections and of the relation of the larger branches to the anterior and the posterior roots. But the peripheral distribution of the nerves of the hand is regarded as one of the commonplaces of anatomy.

"And yet, whenever an attempt is made to apply this knowledge to some case where one of these nerves has been divided, obvious facts remain unexplained, or accessory hypotheses must be invented to account for the apparent difficulties of each individual instance. The more carefully the condition of the affected part is examined, the less does the state of its sensibility correspond with the surgeon's expectation. After he has successfully reunited the ends of the nerve, a conscientious examination only adds to the bewilderment of the observer."

Associated with nerve injury, atrophy of the muscles occurs. This atrophy, if long continued, goes on until eventually fibrosis takes place. All the aids of physical therapy including electricity, massage, active and passive motion, should be used.

Owing to the failure of 27 patients to return to the follow-up clinic, the final observations were made upon 38 cases only. In these cases there were lacerations and contusions of the soft tissues with complete division of one or more tendons, in which a primary suture was attempted. There were 49 cases of the forearm and hand, while the remaining cases involved the extensor tendons of the foot.



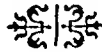
In 5 cases, there was a slight postoperative rise in temperature lasting from one to three days, the temperature becoming normal with no infection in the wound. Seven cases showed a rise in temperature with infection and sloughing, requiring opening of the wound; three of these patients went on to healing with good function, the silk sutures evidently holding the divided tendons in 2 cases, while in the other case chromicized catgut held both nerves and tendons during the infection. Four cases required secondary tendoplasty. In 18 of these cases there was an associated peripheral nerve injury. A primary nerve suture was done in each instance. In one of these cases the ulnar nerve was divided at two different levels. In another case, an inch of ulnar and median was removed,

owing to a double cut of these nerves. With slight freeing of the proximal and distal ends, the gap due to loss of nerve tissue was overcome, and the ends were held in apposition with some tension.

We wish to thank Dr. G. A. Blakeslee for his careful neurological examinations of these cases and his interpretation of injured nerve involvements, Dr. H. Jaffe for his preparation of the microscopic specimens, and Dr. S. Malisoff for his aid in the experimental work.

#### REFERENCES

1. DELAGÉNIÈRE, H. A contribution to the study of the surgical repair of peripheral nerves. *Surg., Gynec. & Obst.*, 1924, xxxix, 543-553.
2. JAFFE, H. Personal communication.
3. HEAD, H. *Studies in Neurology*. 2 vol. N. Y., Oxford U. Press, 1920, i, 66.



#### [SURGICAL SUGGESTIONS]

A CHRONIC abscess in the bone marrow, like acute suppuration therein, often does not show, as such, in the roentgenogram. The appearance is then merely that of the associated osteoperiostitis. There is in the film this suggestion for a diagnosis: there may be very little external thickening of the bone, and the osteitis spreads centripetally, encroaching on and sometimes, in one or more places, obliterating the medullary cavity. This internal thickening is by dense, dry bone, and such an osteitis or osteoperiostitis (when, by its appearance or otherwise, syphilis can be excluded, and when there is no evident necrosis or cortical abscess) indicates the possibility of a medullary abscess. If the medullary cavity is invaded by osseous growth in such a manner as to surround a collection of pus, such a central abscess will appear in the film as a dark area, unless the bone is so thick and so dense as to obscure the picture of the cavity within.

# A METHOD OF RECORDING MUSCLE TESTS

CHARLES LEROY LOWMAN, M.D., F.A.C.S.

LOS ANGELES

IT has been quite generally accepted that muscle reeducation, as applied particularly to paralysis causes, is of very decided value in treatment. Other modalities have their place, such as hydrotherapy, massage, electricity, heat and light, but all of these are mere adjuncts and assistants to nature's processes, whereas actual muscle movements require definite effort on the part of the patient. Other things are done *to* the patient; this he does himself, and in doing it he activates the whole psychomotor mechanism involved in active muscle function.

The influence of motion and the efforts to move any part determine to a large extent its physiological fitness, and, as there is a response in the muscular, glandular and circulatory systems accompanying and resulting from various stimuli, it becomes valuable to be able to measure and note such responses.

The degree of ultimate success of our surgical treatment of paralysis cases will be evidenced by the degree of care and the intelligent handling of both preoperative and postoperative phases, or, in other words, the physiotherapeutic stage.

In this phase of the treatment it is essential that the technician be one as thoroughly trained and competent as it is possible under the circumstances to obtain for any given case, for, unless one is definitely certain that every bit of functional improvement has been obtained by the technician, how can one determine which of several operative steps to apply when the time for surgical interference is decided upon? In fact, the question of when to operate is often determined by the report of the physical therapist, as is also the choice of procedures.

Consequently, if the amount and degree of motor response in a given case is such an important factor it becomes necessary to understand the element involved in obtaining response. The amount of comeback in any given case depends partly on the pathological condition existing, partly on the mental ability of the patient in accepting, teaching and developing power of concentration and action, and also partly on the ability of the physical therapist in recognizing and overcoming any obstacles presented which delay or prevent return of function. One must know the degree of actual residual paralysis in any and all muscle groups in order to prescribe the proper surgical procedures. The question of when this can be ascertained is more or less variable and of all the factors involved in arriving at a decision, the consideration of whether or not the technician has thoroughly mastered the psychological as well as the physiological details, is not the least. The qualifications and capabilities of the person conducting the muscle reeducation needs some check or measurement in order to determine how stable and uniform his results are and what degree of dependence can be placed upon his report in a given case.

We have found at the Orthopedic Hospital School Clinic, as well as in private practice, that an adequate system of measurement and recording of motor responses makes for accuracy in determining surgical procedures based on these records. It also tends to develop the technicians handling the cases, and makes them realize more fully how really valuable and important a contribution their particular work is to the success of the clinic. Time must be conserved in a busy clinic, and

when one has to trace back through a mass of typewritten data to obtain the original record and then pick out the progress recorded at different dates for comparison, one's eye cannot take in at a glance enough to arrive at a quick conclusion. It is extremely important to note the degree of improvement as well as the length of time passed in obtaining it, in order to decide whether to go on with the reeducational work or to operate.

By having one person only make the muscle analysis for the record once a month, the element of personal equation involved is ruled out and differences of response at different times can be more accurately explained. We have used a scale familiar to many, composed of nine gradations, estimating muscle movement, effect on gravity as evidenced by joint movement, and muscle action against both gravity and resistance load. The following table with abbreviation and numerical equivalent explains these points:

Inactive.....I A	0	No appreciable motion.
Action weak...A W	1	Definite muscle contraction.*
Fair minus....F M	2	Definite muscle action without much influence on the joint.
Fair.....F	3	Well defined action almost up to movement of the joint.
Fair plus.....F P	4	Beginning action of joints but not against gravity or enough to overcome friction of table.
Good minus...G M	5	Beginning action against gravity or friction.
Good.....G	6	Well defined control over gravity or friction.
Good plus....G P	7	Beginning power against added resistance.
Normal minus N M	8	Increase against resistance but not quite normal.
Normal.....N	9	Normal.

\* Between I A and A W is fibrillation or questionable contraction.

It was found after several years of recording by using the abbreviations in

columns on either side of a printed list of joint movements, that as the record became fuller it took longer to figure out the comparisons and form conclusions as to the amount of progress made. We consequently adopted the method of recording by numerical equivalents, which greatly expedited the facility of judging progress. The first column in our present chart shows both the abbreviation and number while the subsequent columns have only the numeral. Each column is dated above and shows the initials of the one making the test. In this way tests by the physical therapist can be compared with those of the surgeon, or trained technician, and a check obtained upon the abilities of clinicians, internes, students or any one training for this work.

On Chart I made July, 1925, to May, 1927, one is immediately struck with the rapid return of power in the thigh groups, as the eye notes quickly, for instance, thigh flexion through progression of 3, 6, 7, 8, 9. Still more valuable is the glance at the right knee showing a gain from very weak to nearly normal. One concludes at once that the comeback is going to be favorable. The adduction register at Point 6 nearly balances with abduction at Point 7. Thus, deformity in either of these planes is hardly to be expected from muscle imbalance. As one notes that high numbers prevail at the end-reading on all muscles controlling action at the hip joint, one says at once, "no operation indicated." Study of the foot and ankle section shows that, on the whole, the right foot is weaker than the left. Everters are more active than inverters, but both are extremely weak. Note that progress has for the first three months or so begun to indicate the future probabilities as the knee and thigh are in good condition and one sees that alignment and foot stabilization are all that will be needed to make this leg brace-free. Note the later record and this prognosis seems about correct, i.e., the right foot shows that throughout the whole period the Achilles has continued more powerful

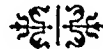


but also that combined with a transplant a brace-free leg will be expected. The left thigh is seen to have been improved but not throughout. The flexor weakness represented by 4 means future difficulty in stair climbing. The extensor 9, however, allays any anxiety as regards standing, as long as we note that with flexors grading 7 against quadriceps 3 we can make a biceps-to-patella transplantation. This will assure a reasonably stable leg, further confirmed by noting the grading of foot muscles which are all strong. From the findings of the chart, even though one did not see the patient, the future course and prognosis of the case can be determined with a good degree of certainty.

The possibility of getting at least a reasonably good idea of the status of a case by simply a glance at such a chart, is enhanced by a photograph of the case as originally presented.

Differences in grading muscular power can be noted and changes may be accounted for by the condition of the patient at the time, and fatigue, excitement, cold muscles, etc., may all be allowed for. Allowance must also be made for the personal equation which usually accounts for at least a variance of one degree. Preferably the same persons should make all the tests, and the longer they do this the more reliable they become and the more dependence the surgeon can place upon their findings in deciding upon reconstructive procedures.

I am not aware that this system has been used in other clinics and I offer it as a time-saving suggestion and one that can be used in any place as against mechanical scale-testing, which, of course, is more ideal but not so adaptable to clinical needs.



#### [SURGICAL SUGGESTIONS]

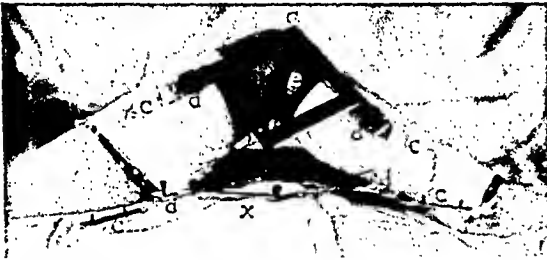
THE chronic, non-perforated bone abscess tends to become sterile or nearly so; its organisms are dead or attenuated. Therefore open osteotomy—the usual procedure for its relief—need not be, and should not be performed. It can be cured by simple evacuation of the pus through a small drill hole—a minor operation that can be done under nitrous oxide. A rubber dam drain may be inserted down to, but *not into*, the bone for a few days; and probing and scraping the cavity must be avoided lest this introduce secondary infection. The pain is immediately relieved and, unless a minute circular sequestrum forms about the drill passage, the tissues heal quickly and the opening into the bone soon closes.

# A CORRECTIVE DEVICE FOR SOFT TISSUE CONTRACTIONS OF THE KNEE AND ELBOW JOINTS

HARVEY C. MASLAND, M.D.

PHILADELPHIA

THE corrective device here illustrated is composed of selected pieces from a splint equipment that I have used for some years in the treatment of fractures of the long bones. The instrument is intended to exert a gradual elastic stretch upon the contracted soft tissues of either a knee-joint or elbow-joint over a sufficiently prolonged period of time. It need hardly be stated that where there is bony ankylosis, no such device is of any value.



a. Splint arms pivot screw. b. Lever arms pivot screw. c. Metal strip ends buried in plaster. d. Clamping brackets. e. Elastic bands between a and b. x. Perspective side view of one lateral assembly.

Those who have operated upon these soft tissue contractions, are aware of the extensive cutting of tendons and fascia that is necessary in severe cases and the dangerous stretch upon the nerves that makes immediate correction of the deformity difficult, often impossible.

My device exerts much the same mechanical influence upon the parts as given by the Lemuel Smith design. It appeals to me, however, as being more readily adjustable and giving a more definite control of the extension in connection with the flexion. There is less waste of power through friction. The flexion mechanism, located in the angle of the joint, is not so conspicuous or inconvenient. Whatever the degree of

angulation of the joint, the direction of my elastic pull is unchanged, and the lever arms can be adjusted to increase the leverage. It is more satisfactory than the Stromeyer or the Lord brace because it is always possible for the patient to exercise the joint voluntarily through any degree of motion that he may possess. This is of particular value when there are contractions from surface cicatrices.

It must be borne in mind that the strain sufficient to cause the pathological fibrous tissue to yield must be borne by the normal soft tissues above and below the joint. For this reason I employ extensive plaster of Paris casts on the thigh and leg. The leg portion extends to the malleoli, with a narrow substantial gauze pad over the tendo Achillis.

The edges of the cast are prevented from cutting the skin by an imbedded artificial leather cuff. The cast is applied next the skin, as this without padding gives a snug fit upon the skin surface. A cast, like any other material, can irritate from too much pressure, but I have yet to see the plaster itself irritate the skin unless it became loose and was permitted to rub.

Leather in place of the plaster is a more expensive construction and must be made to fit the individual case. It is not as rigid nor will it distribute the pressure as evenly as does the cast. It is, however, more durable in the ambulatory cases.

This instrument will give either simple flexion, or flexion with extension. For flexion alone, the pivot joints (a, in the illustration) of the splint arms are placed over the axis of the patient's joint. Where extension is also required, as in the usual knee-joint contracture, the pivot joints

are placed anterior to the axis of the knee joint. The amount of the extension depends upon the distance of the pivot joint anterior to the axis of the bone joint. It will be seen that with this position the splint arms are longer than the underlying bone lengths. In the straightening of the splint arms, there results a pull on the bones as well as a correction of the flexion.

To apply this instrument, pencil marks are made above the joint where it is intended to have the pivot joint of the splint arms.

Metal strips with projecting ends are imbedded in the casts laterally and opposite each other. The strips are so placed in the casts that the projecting ends

point toward the pencil marks over the joint. The diamond-shaped constructions are then clamped to these projecting ends on each side of the limb with the pivot joints opposite each other. The clamping brackets allow a sufficient leeway so that this adjustment can be made without difficulty.

A sufficient number of rubber bands are then stretched between the screw heads of the pivot joints of the splint arms and the opposite pivot screw heads of the lever arms (*b*).

Subsequent treatment is concerned chiefly with supervision of the proper amount of elastic tension and replacing a cast should it wear or become too loose.



### THE MEDICAL MAN AS A SURGICAL DIAGNOSTICIAN

The majority of acute surgical illnesses, with the possible exception of traumatic lesions, are first seen by the medical man. He is the first to decide whether a given case has any surgical aspect and whether a surgical consultation is necessary; his fingers are the first to feel of the abdomen, his eyes the first to note the patient's appearance and reactions, his opinion the first to determine whether or not any delay in operative treatment is permissible. Therefore, the medical man must strive to develop in himself to as high a degree as possible, that indescribable quality known as good surgical judgment and must endeavor to make the same quick,

accurate, almost uncanny diagnoses that the surgeon does. This is an important point. Too often the medical man is guilty of procrastination in the treatment of the "acute surgical abdomen." There are too many cases where the medical man's surgical judgment is fallacious, where he overlooks an acute surgical emergency and where he calls in the surgeon too late to prevent an unnecessary fatality. The first duty of the medical man in the treatment of the acute surgical abdomen, therefore, is that of a diagnostician. He must recognize the condition at once and send for surgical help.—  
REGINALD FITZ in *Boston M. & S. J.*



# AN ADJUSTABLE METATARSAL PAD

HENRY MILCH, M.D.

NEW YORK

IN treating so-called "falling of the anterior arch" of the foot, as well as conditions in which, from walking on the heads of the metatarsal bones, the patient develops severe callus on the plantar surface of the foot, some difficulty

the piece of felt. To prevent backward displacement of the pad, a small piece of cord elastic is placed between the first and second toes and its ends are sewed to the elastic above and the felt below (Figs. 1 and 2).

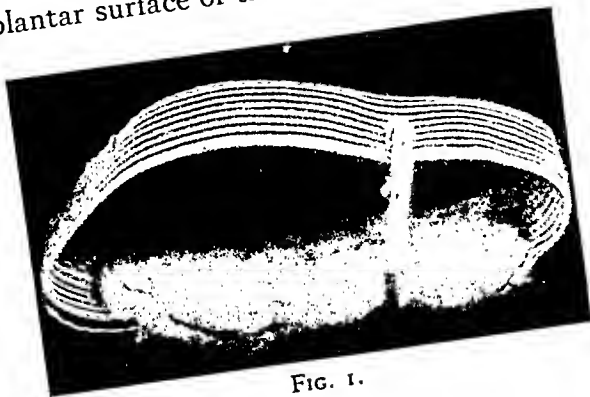


FIG. 1.

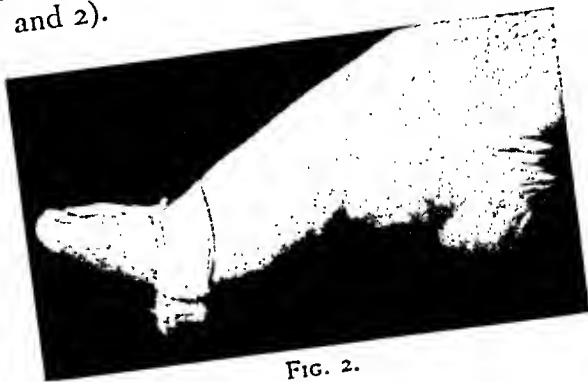


FIG. 2.

has been experienced in accurately placing the metatarsal pad or bar. I have had some success in relieving this condition by the use of a device which is a simple modification of the measures at present in use.

A piece of piano felt is cut to fit the foot. It may be either in the shape of a pad or if necessary in the shape of a bar. The sides are beveled. A piece of woven flat elastic band sufficiently long to fit over the dorsum of the foot is sewed to both ends of

The apparatus can be made by anyone in a few moments. It permits of absolutely accurate maintaining of the felt in position. It is cheap. By means of a few snips of the shears, it can be modified as conditions vary. It obviates the necessity of remodeling shoes in cases where the metatarsal bar is deemed advisable. The device can be worn either beneath or above the stocking. If soiled, it may be replaced in a few moments with almost no cost or inconvenience.



# MAMMARY TUBERCULOSIS

## REPORT OF A CASE IN THE MALE\*

ARTHUR M. DICKINSON, M.D., F.A.C.S.

ALBANY, N. Y.

AS compared with tuberculosis of the lungs, bones, meninges, intestines and kidneys, tuberculosis of the breast is a relatively uncommon condition. It was first described by Sir Astley Cooper in 1829, under the caption of "Scrofulous Swelling of the Breast." In 1881 DuBarr made microscopic studies of tuberculosis of the breast and reported his findings. Interest in this unusual condition then apparently lapsed, judging by the absence of case reports, until 1914 when Deaver<sup>1</sup> reviewed the entire literature of tuberculosis of the mammary gland and reported 77 new cases. Barker<sup>2</sup> in 1926 reported an additional 48 cases for the period from 1914 to 1926, together with 15 new cases. Later in 1926, Fox and Roblee<sup>3</sup> reported 6 more cases from the Barnes Hospital of St. Louis. These figures are given to illustrate the frequency of tuberculosis of the breast and include cases occurring in both sexes.

Tuberculosis of the male breast is very uncommon. Swan and Fry<sup>4</sup> in 1926 reviewed the literature for cases of tuberculosis of the male breast and were able to find but 12 such cases reported, to which they added a personal one.

The incidence of tuberculosis in relation to other pathological conditions of the breast is variously given. Durante and MacCarty<sup>5</sup> state that tuberculosis constitutes about 0.5 per cent of all pathological changes in the breast. Cheever<sup>6</sup> places the incidence at 1.7 per cent, Shipley and Spencer<sup>7</sup> report it as 1.49 per cent. However, Barker in his very complete résumé of the subject states that figures obtained from the Department of Pathology of the University of Michigan Hospital show an incidence of 2 per cent.

The bovine type of the tubercle bacillus

seems to be that most often responsible for tuberculosis of the breast. It has been isolated in some instances, and the usual chronic course of the disease also bespeaks its incidence. Tuberculosis of the breast may occur at any age but it is more common between the ages of twenty and fifty, according to Deaver. Shipley and Spencer state that 70 per cent of the cases occur between twenty and seventy years of age. The youngest patient recorded was a colored girl, aged thirteen, a case reported by Cahill.<sup>8</sup>

Apparently the breast offers considerable resistance to the development of tuberculosis, a resistance much more marked in the male than in the female. The conception of some of the modern pathologists as to the normal changes in the female breast, seen at puberty, during lactation and after the menopause and the relationship of various breast tumors, which they consider are largely phenomena or sequellae of subinvolution, throws a little light upon the problem of tuberculosis of the breast. It would seem to help explain also, why both tumors and tuberculosis are more commonly seen in the female than in the male breast.

As with any other type of infection, tuberculosis of the breast may arise through infection by way of the lymphatics, the blood stream, direct extension from neighboring foci or a break in the overlying skin. The theory was formerly held that tuberculosis of the breast was most commonly secondary to a tuberculosis of the axillary or cervical lymph nodes. Today it seems certain that not more than 5 per cent of cases arise in this manner. In about 67 per cent of reported cases there is no evidence of tuberculosis elsewhere in

\* Read before the Medical Society of the County of Albany, September 27, 1927, at Albany, N. Y.

the body. Of course there are quite frequent cases where the breast is secondarily involved by a tuberculous process in adjacent structures, such as a case reported by Durante and MacCarty<sup>5</sup> in which there was a pulmonary tuberculosis with empyema. Such cases, however, are not included in this discussion.

As in malignancy, the question of the influence of trauma upon the development of the tuberculous process is still mooted. Some authorities, notably Cahill,<sup>8</sup> feel that it plays an important part. This does seem logical. With trauma, local resistance is lowered and so circumstances are more favorable to the localization and development of the process.

Tuberculosis of the breast is unilateral, as a rule. The lesion may be nodular, confluent, disseminating or sclerosing. The common appearance is that of a nodular mass, usually the first symptom noted. The mass is quite hard and its boundaries are not clearly defined. Instead of a single mass there may be several smaller masses. At first it is painless, at least that seems to be the opinion of the majority of writers; on the other hand, Hinton and Lawson<sup>10</sup> believe that pain is a common early symptom. There is usually some tenderness but less than is found in malignant conditions. In many of the reported cases, the skin over the mass is said to present the characteristic "pig skin" appearance. Retraction of the nipple occurs at some stage in about 25 per cent of the cases. As the infection progresses, adherence, redness and inflammation occur, and later, in neglected cases, the breast tissue breaks down and sinuses form. This occurs in about 25 per cent of cases, according to Barker. In the rapid type, sinuses may form in two months. Involvement of the axillary glands occurs late, as a rule. Tuberculosis of the breast may coexist with carcinoma, as in the case described by Smith and Mason.<sup>9</sup>

Early diagnosis is not easy. In many instances it must depend upon the chronicity of the lesion with the tendency to

softening. In some instances it is impossible to arrive at a positive diagnosis without pathological examination.

The prognosis in tuberculosis of the breast is good with radical treatment at the proper stage. Cases presenting with sinus formation may require reoperation and prolonged treatment; they ultimately yield to perseverance, however.

Treatment consists of surgical eradication of the disease. If removal of the diseased tissue is thoroughly accomplished, even cases of long standing with sinus formation will yield. In addition to surgery, heliotherapy, quartz lamp treatment and general hygienic measures are of value.

#### CASE REPORT

R. T. came to my office May 11, 1927, complaining of a painful swelling of the right breast. He was thirty-three years of age and the father of six children. His past history was negative. There were no known cases of tuberculosis in the family. He stated that on April 15, 1927, while swinging a sledge, he strained the muscles of the right side of his chest. That night he noticed a dead feeling in that area. Two days later the breast commenced to swell but was not painful. The swelling increased gradually and four days after the so-called strain, he consulted a physician who advised hot packs. The condition became progressively worse from this time.

There was a swelling of the right breast, perhaps more marked in the upper, outer quadrant. The breast was slightly tender. No fluctuation could be made out but there was a suspicion of an abscess. No nodules were palpated in the breast. The overlying skin appeared normal and was freely movable. No glands could be palpated in the axillary, clavicular or cervical regions. General physical examination was negative; indeed, the patient appeared very well nourished and healthy. He was advised to enter the hospital for further observation.

On May 17, he was admitted to the Memorial Hospital. The breast was aspirated and about 10 c.c. of creamy pus were obtained. Cultures from this were sterile; guinea pig inoculation, however, was reported positive in six weeks. The blood count showed red cells 4,520,000; hemoglobin 100 per cent (Sahli); white blood cells 10,000, polymorphonuclears

85.5 per cent. The blood Wassermann reaction and the urine were negative. During this two-day period of observation, the temperature was normal except for one rise to 99.2°; the pulse varied from 68 to 72 and the respiratory rate from 16 to 20.

Amputation of the diseased organ was performed on May 19 under ether anesthesia. The incision was outlined as in a radical breast amputation for malignancy. Dissection was begun in the axilla with the thought that there might be some infected glands buried in the axillary fat. This area being cleared of its contents, dissection was continued downward toward the breast. As the upper portion of the breast was approached, a huge abscess was opened. Four to 6 oz. of pus were evacuated. The abscess cavity extended upward almost as far as the clavicle and downward to the seventh rib. It was located between the pectoralis minor and the chest wall. Realizing that to continue with the radical procedure would accomplish little, the operation was terminated with a simple mastectomy and drainage of the abscess. Rubber tubes were inserted and the wound was closed under considerable tension. Five days after operation all drainage material had been removed, but the wound edges had retracted leaving two open areas, each about the size of a silver quarter. Drainage was moderate in amount. These areas were allowed to granulate; they did quite promptly under sunlight and balsam treatments. The patient was encour-

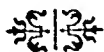
aged to bare his chest with the dressings off, to graded doses of sunlight. Nine weeks after operation, he was discharged from the hospital with the wound all healed except for two small discharging sinuses. He was last seen seventeen weeks after operation, and at that time the wound was completely healed except for two very small areas covered with solid crusts.

The pathologist reported: "Breast, tuberculosis, mainly about the pectoral muscles. Lymph nodes, endometrial hyperplasia; no evidence of tuberculosis."

#### REFERENCES

1. DEEVER, J. B. Tuberculosis of the breast. *Am. J. M. Sc.*, 1914, cxlvii, 157.
2. BARKER, H. B. Tuberculosis of mammary gland. *Arch. Surg.*, 1926, xiii, 435.
3. FOX, B., and ROBLEE, M. Tuberculosis of mammary gland. *Ann. Surg.*, 1926, lxxxiv, 678.
4. SWAN, R. H. J., and FRY, H. J. B. Tuberculosis of male breast. *Brit. J. Surg.*, 1926, xiv, 234.
5. DURANTE, L., and MACCARTY, W. C. Tuberculosis of the breast; a report of 10 cases. *Ann. Surg.*, 1916, lxiii, 668.
6. CHEEVER, D. Tuberculosis of the mammary gland. *Surg. Clin. N. Am.*, 1921, 919.
7. SHIPLEY, A., and SPENCER, H. R. Tuberculosis of mammary gland. *Ann. Surg.*, 1926, lxxxiii, 175.
8. CAHILL, J. A., JR. Tuberculosis of mammary gland. *Surg., Gynec. & Obst.*, 1925, xl, 227.
9. SMITH, L. W., and MASON, R. L. Concurrence of tuberculosis and cancer of breast. *Surg., Gynec. & Obst.*, 1926, xliii, 70.
10. HINTON, J. W., and LAWSON, T. C. Tuberculosis of breast as observed at Bellevue Hospital. *Ann. Surg.*, 1926, lxxxiii, 170.

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#### [SURGICAL SUGGESTIONS]

WHETHER only a drop or two of pus in the cortex or cancellus, or several drams in the medullary canal, chronic bone abscesses have a uniform symptomatology—persistent pain (often radiating and mistreated for "neuritis" and "rheumatism") and distinct localized bone tenderness. The condition is usually afebrile but sometimes subfebrile (100°, even 101°).

TRANSACTIONS OF  
THE SECTION OF SURGERY  
NEW YORK ACADEMY OF MEDICINE

Meeting of October 7, 1927

THE CHAIRMAN, DR. MORRIS K. SMITH, PRESIDING

PRELIMINARY MEDICATION IN  
GENERAL ANESTHESIA  
WITH SPECIAL REFERENCE TO THE MARGIN  
OF SAFETY AND POSTOPERATIVE  
LUNG LESIONS

CHARLES W. HOOPER, M.D., AND JAMES T. GWATHMEY, M.D.  
NEW YORK

**P**RELIMINARY medication, intelligently selected and used, abolishes all psychic impulses, maintains the normal ratio between respiration and circulation, renders shock less liable before, during and after the operation, and shortens the period of convalescence.

The fear of an operation either for extracting a splinter, or for a laparotomy, is universal. The dread of the anesthetic is often even greater than that of the operation. Women and children openly acknowledge it, while men attempt to suppress or ignore it, and it is with these latter cases that immediate fatalities occur. The following cases represent extreme fear: When Simpson was for the first time about to try chloroform on a patient, the orderly who was carrying the bottle fell and spilled it; no other being obtainable, Simpson proceeded without anesthesia with the operation, which was for hernia. The patient died at the first incision. Later another patient to be operated upon demanded chloroform; his condition being low, the surgeon feared to grant his wish but a cloth was held over his face; he took four inhalations of air and died. A third instance is that of the French surgeon

Désault, who drew his fingernail over the perineum to mark the line of incision, when the patient suddenly gave a cry and died.

Under local or spinal analgesia no immediate deaths from fear have as yet been reported, but pneumonias do occur occasionally and psychic shock is more common than with general anesthesia. To allow a patient to come to the operating room with all senses alert may cause an ineffaceable memory scar, that might unconsciously deter him from a necessary operation later. We therefore urge, for all methods whether local, spinal or general, preliminary medication that will render the patient indifferent to his surroundings or unconscious. This medication should be so ordered that when necessary the cooperation of the patient may be secured. The usual single dose of morphine,  $\frac{1}{8}$  to  $\frac{1}{4}$  grain, is insufficient to abolish all psychic impulses, as a "rise of blood pressure 10 to 40 mm. systolic ordinarily, and occasionally on up to 80 or 90 mm. occurs, just prior to the administration of the anesthetic."

The comparison of a patient with and without preliminary medication is all in favor of the patient properly prepared.

\* Presented with lantern slides and photomicrographs. By invitation.

Without such medication, the stage of excitement is seldom absent, unless one of the gaseous anesthetics is used as the introductory agent, and physical restraint is necessary. With the open drop ether method, a shudder or tremor passes over the body such as is seen at electrocutions or when an animal is hit in the head at the stock yard. Cyanosis and sweating, with more or less hyperpnea are not uncommon. It is at this period that fatalities often occur.

With preliminary medication, a smooth induction is usual, with no rise in blood pressure or change in respiration and pulse, and with a pink color. On account of this smooth induction, shock is less apt to occur during operation. Finally, the patient emerges in a pain-free condition and usually without nausea or vomiting.

The ideal medication is one that synergizes with the other agents. Such a drug is magnesium sulphate. Used in small amounts as recommended, it is absolutely and unqualifiedly safe. Two cubic centimeters of a 50 per cent solution has been used over 20,000 times at the Lying-In Hospital in New York. In all, about seven sloughs have occurred, which is about the same as with morphine and water. It has not endangered the life of mother or child. It synergizes with morphine, prolonging its effect three or four times, i.e., the value of the morphine is increased 50 to 100 per cent. At the Presbyterian Hospital in New York, two tables were prepared from a number of surgical cases and each table was selected in sequence from over 200 similar cases. The patients receiving magnesium sulphate and morphine did not require a postoperative sedative for an average of sixteen hours. A parallel series of cases, receiving the same amount of morphine with water, required a postoperative sedative in four hours. The Presbyterian Hospital was using at this time a breast hypodermoclysis of 300 to 400 c.c. of a sterile and chemically pure 4 per cent solution of magnesium sulphate, given at 110° F.

The late Memphis surgeon, Dr. F. D. Smythe, used the same procedure and obtained similar results; but this technique required the presence of a house surgeon and was quite painful to the patient. Dr. Smythe then made the remarkable discovery that the same results could be secured with a much simpler technique. He used three hypodermic injections of  $\frac{1}{8}$  grain of morphine dissolved in 2 c.c. of a 25 per cent solution of magnesium sulphate with  $\frac{1}{150}$  grain of atropine added to the second dose given, at twenty minute intervals. One third of the patients thus prepared did not require any analgesic after operation. They also went four times as long as patients who were given morphine dissolved in sterile water alone, before an analgesic was required. The stage of induction is shortened and there is rarely a period of excitement. As more oxygen or air can be given, a pink color prevails with a pulse of 80 to 84.

Harmon<sup>6</sup> also gives data showing the synergism between magnesium sulphate and morphine with resultant greater postoperative comfort, less nausea and vomiting and a decreased amount of morphine. The personal observation of one of us (Gwathmey), especially with colonic anesthetics, is that a more perfect brain block results, with better relaxation and increased analgesia, when magnesium sulphate is used. It also synergizes with ether, increasing the margin of safety, and reducing the amount used. In the laboratory,<sup>7</sup> it has been proved that after preliminary medication, using 7 per cent ether intravenously, anesthesia comes on sooner, less ether is used and the margin between complete anesthesia and respiratory failure is widened, thus making anesthesia a safer procedure. In this way animals are anesthetized more easily and with less excitement. The preliminary used with these experiments was paraldehyde and potassium bromide. Meltzer and Auer in 1913 to 1914, using one half or less of the anesthetic dose of magnesium sulphate, anesthetized animals deeply with one tenth the dose of ether

otherwise required. Hooper and Gwathmey in 1925 determined quantitatively that using one half the anesthetic dose of magnesium sulphate, with one ninth the anesthetic dose of ether produced surgical anesthesia, without increasing the toxicity.

The medication suggested at this time, for adult patients, is  $\frac{1}{8}$  grain of morphine in 2 c.c. of a 50 per cent solution of magnesium sulphate one hour before operation. This medication is to be repeated at fifteen minute intervals, twice for males and once for females.<sup>8</sup> In addition, 10 grains of chlorotone should be given either by mouth in capsule, or as a suppository. If unconsciousness is desired, forty minutes before operation the following retention enema should also be given: paraldehyde, 2 dr.; ether, 2.5 oz.; oil, q.s. ad, 4 oz. This medication may be given by a nurse, and the patient will not require any special attention, as surgical anesthesia with relaxed tongue and jaw will not occur. The terminal anesthetic will be greatly reduced, for instance, if nitrous oxide is used, and the oxygen can be increased to 50 per cent or over. If chloroform or ether is used, only a few drops or a very attenuated vapor will be necessary to complete the anesthesia.

The main object of preliminary medication, as deduced from our laboratory experiments, is to avoid the possibility of postoperative lung lesions. At this time we do not attempt to explain these lung lesions.<sup>9</sup> We merely give the facts as found.

#### EXPLANATION OF PLATES\*

The autochrome photomicrographs show that regardless of the anesthetic employed, whether ether, nitrous oxide or one of the hydrocarbon gases (acetylene, ethylene or propylene), lung lesions occur when animals are not given preliminary medication. These results represent a year's work, in which approximately 500 animals were employed to determine the value of preliminary medication in general anesthesia. These laboratory data show what clinical

experience verifies, that proper preliminary medication is as important as the general anesthetic agent.

The albino rats employed in the experiments were obtained from one source and were kept on a constant well-balanced diet for at least two weeks before the tests. They were fasted for from sixteen to twenty hours immediately before the experiments, then weighed, and the preliminary medication was injected per kilogram body weight. Water was supplied during the fast period.

Four animals were employed for each experiment. Two of the animals were given intramuscularly 0.8 c.c., per kilogram body weight, of magnesium sulphate solution (50 per cent) with novocain (2.5 per cent) and morphine ( $\frac{1}{8}$  grain in 2 c.c.). Ten minutes after the preliminary injections all four animals were placed in the gas chamber and given the same mixture with the gauges so set that all animals were killed within thirty minutes. The controls jumped around and struggled against the anesthetic. The animals receiving the preliminary medication fell asleep with no excitement stage. After the animals were killed, they were immediately necropsied. Lung lesions were found in those that did not receive preliminary medication. Gross examination showed distention, edema and congestion. With ether it was not unusual to find atelectasis involving a portion of one lobe and often massive atelectasis involving one or more of the lobes.

The heart, kidneys and liver showed no gross lesions, and they were not examined microscopically. The microscopic lesions were perivascular edema, diffused petechiae, alveolar spaces filled with fluid and bronchi containing edematous fluid.

On the other hand, the lungs of the animals that received preliminary medication were relatively normal.

Thousands of individuals have been anesthetized without preliminary medication, and have made uneventful recoveries. However, the facts here presented may possibly explain certain fatalities, which

\*These plates can be found in NELSON'S "Loose Leaf Surgery," Vol. 1, opposite page 514.



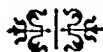
have hitherto been either unsolved or referred to other causes.

#### SUMMARY

The removal of psychic impulses, the reduction in the amount of the terminal anesthetic, the increased margin of safety and the prevention of lung lesions are sufficient reasons why preliminary medication should be used with all methods of analgesia and anesthesia.

#### REFERENCES

1. SOLLMAN, T. A Manual of Pharmacology. Ed. 3, p. 735.
2. COBURN, R. C. Blood pressure in operative surgery and general anesthesia. *J. A. M. A.*, lxxxii, 1748.
3. GWATHMEY, J. T., and HOOPER, C. W. Inter-State Post-Graduate Assembly of America. St. Paul, Minn. Oct. 12-16, 1924.
4. GWATHMEY, J. T., and GREENOUGH, J. *Med. Record*, 1921, xcix, 889.
5. SMYTHE, F. D. Further experiences with synergistic analgesia. *J. Tennessee M. Ass.*, 1922, xv, 97. Synergistic Analgesia. *AM. J. SURG.*, Anesthesia Supplement, July 1923, xxxvii, 85.
6. HARMON, M. S. Preoperative narcotics. *Current Researches in Anesthesia & Analgesia*, Feb., 1925, iv, 15.
7. GWATHMEY, J. T. Anesthesia reviewed. *N. Y. M. J.*, Oct. 28 and Nov. 4, 1916.
8. *Jour. Lab. & Clin. Med.*, St. Louis, May, 1925, x, No. 8.
9. Nelson's Loose Leaf Surgery.



# POSTOPERATIVE COMPLICATIONS OF SUPPURATIVE APPENDICITIS

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THE story of success or of failure in the treatment of suppurative appendicitis is to be found in the notes recording the postoperative events in their sequence to recovery or death of the patient. In a large measure these postoperative events are influenced by such factors as the duration of the disease, the individual resistance of the patient, and the nature of the operative procedure. Recognition of this fact has led to the general acceptance of such fundamental principles of treatment as early operation, support and protection of the patient by every possible means, and the adoption of such surgical measures as may best serve to control the pathological process in cases where a suppurative appendicitis is encountered.

It should be of interest to observe how far the application of these principles has come toward achieving the recovery of the patients to whom they have been applied. Also, it is of importance to review the results of various methods of postoperative care for the relief of the complications of this disease, with a view to establishing their validity, or of recognizing their need of improvement. This makes desirable the reporting of series of cases from time to time, for comparison with the records of former years. It is by such means that the surgeons dealing with the problem may come at last to agreement upon the best methods of managing this most common of surgical emergencies.

The literature of the subject is already voluminous, and this paper has been prepared with the object of adding one more report to the growing mass of evidence. It reviews the postoperative complications of suppurative appendicitis as seen in a fairly busy surgical service over a period of five years.

During this space of time, in a total of 974 cases of acute appendicitis, there have been treated at the Roosevelt Hospital from January, 1922 to January, 1927, 392 cases of suppurative appendicitis. From this group are excluded all such cases of appendicitis as have been classified either as "chronic" or "interval." Excluded also are those cases, 582 in number, classified as acute appendicitis, in which no suppurative process was present at operation, nor supervened later. The rather restricted group that remains comprises those cases in which there was definite suppuration requiring drainage. These cases showed empyema or gangrene of the appendix (either partial or complete), or perforation, or marked exudate, and were associated with more or less widespread peritonitis, or with abscess. It was in this group that complications of the disease were most frequently encountered and proved of the most vital consequence. There were 83 cases, or 21 per cent of this series, that developed complications.

Reviewing these cases with reference to the pathological process encountered at operation, it was found that 290, in addition to the disease of the appendix itself, had a local peritonitis or periappendicial abscess, while 102 had diffuse peritonitis. As to the results of treatment in the 392 suppurative cases, 337 were discharged cured, 14 improved, 41 died. These figures represent a mortality from all causes of 10.5 per cent of the drained cases and 4 per cent of all the acute cases. These mortality figures may be compared with those of Bancroft,<sup>1</sup> 6.8 per cent, and of Beekman<sup>2</sup> who, averaging fifteen reports from various sources on 14,154 cases, found 8.7 per cent of deaths.

While these patients came to us at vary-

ing intervals after the onset of symptoms, ranging from six or eight hours to three or four days, the plan of treatment followed was essentially the same in all but one case, obviously moribund on admission. Following the principle of Gerster<sup>3</sup> that "in the vast majority of cases procrastination is more dangerous than operation," the diagnosis of acute appendicitis with or without peritonitis was considered the indication for immediate operation. These cases were operated upon as emergencies, irrespective of the hour.

Following a cleansing enema, shave, and iodine preparation, the right intermuscular incision was the approach of choice. The rectus incision was usually reserved for those cases in which there was some doubt as to the diagnosis, being used most frequently in those female patients in whom a pelvic lesion was suspected. The appendix was removed in all cases except where there was need for shortening the operation on account of the patient's condition, or danger of spreading septic material in the peritoneal sac by excessive manipulation. The stump was inverted and buried whenever possible. Gangrene of the appendix, rupture or the presence of a purulent or sero-purulent exudate were the indications for drainage. The means of drainage employed was either fenestrated rubber tubing or a wrapped tube (i.e., a cigarette drain enclosing a rubber tube). About an equal number in the series were drained by each method. No attempt at mechanical cleansing or irrigation of the abdomen was made, but suction was uniformly employed to remove carefully all obtainable septic exudate.

The postoperative complication that gave the greatest concern in this series and was responsible for 63 per cent of the total mortality was peritonitis. When, in these cases, it became evident that a generalized peritonitis had developed or had not begun to subside after operation, it was the policy to discontinue all nourishment and fluid by mouth, to keep the patient in Fowler's position and to admin-

ister normal saline solution by hypodermoclysis or glucose in saline solution by vein, and tap water by rectum, sometimes by Murphy's method, though more usually by repeated small (6 oz.) injections. Morphine was used for the control of pain and to insure quiet, but not to the extent of full narcotization as advocated by Ochsner<sup>4</sup> and Crile.<sup>5</sup> Instead of favoring "bowel-splinting" it was our effort to stimulate bowel elimination with the object of avoiding, as far as possible, the toxic effects of ileus, and of controlling distention. To this end colonic irrigations were employed, usually in conjunction with pituitrin administered hypodermically. Ox-gall, or milk-and-molasses enemas were also used, and hot stupes were applied to the abdomen. Lavage was resorted to for the control of vomiting and gastric dilatation. Transfusion as a means of support has been found of value in a number of the cases.

Of the 102 cases classified as having diffuse peritonitis at operation, in 71, or nearly 70 per cent, the disease was controlled and went on to recovery under this treatment, while in 27 it proceeded with fulminating peritonitis. In addition, in four cases diffuse or generalized peritonitis developed following operations in which a more or less localized abscess was found. Of the total of 31 cases in which peritonitis developed or was not controlled 26 died. The five who survived raise the recovery rate in all cases of diffuse peritonitis to 71.7 per cent, almost the exact figure reported by Fowler<sup>7</sup> in 1911.

In passing, it might be of interest to note the cases in this group that showed multiple complications. One, a child, had pneumococcus peritonitis and died twenty-five days after operation. One patient had diabetes and died on the sixth day in spite of the use of insulin. Two patients were pregnant, both a little over four months, and both died after aborting. Two patients had uremia, and one, a man of sixty-eight, had myocarditis and asthma. One died of pulmonary embolism on the fifth day.

Following the recommendation of

McKinnon,<sup>6</sup> high enterostomy for paralytic ileus was performed in five of these cases on the second and third days. One recovered.

The death of 26 out of 31 patients in whom this grave complication, general peritonitis, arose bears evidence of the severity of the disease and suggests that there may be room for improvement in the treatment of the condition. Although the statistics are difficult of comparison because of the interpretations of the condition by different observers, it is interesting to note in this connection the varying methods of treatment employed in appendicitis with diffuse peritonitis. Deaver<sup>8</sup> advocates delaying operation where diffuse peritonitis is present until localization and abscess formation have occurred. Ochsner<sup>4</sup> advises against operation until the acute symptoms have subsided. McLeod<sup>15</sup> recommends operation, but quiet and morphine liberally thereafter. Crile,<sup>5</sup> in support of his anoci treatment, reports 2 deaths in 391 cases of acute appendicitis. Judd<sup>9</sup> prefers the use of an ice coil on the abdomen and no opium. Gerster,<sup>3</sup> who in 1910 advocated early operation in peritonitis, had a mortality of 14 per cent. On the other hand, Torek<sup>10</sup> twenty years ago reported 83 per cent of cures in 18 cases, following washing of the abdomen and no drainage in diffuse peritonitis; and Blake<sup>11</sup> about the same time, but using drainage, had a 19.2 per cent mortality in 78 cases. Costain,<sup>12</sup> who recommends lymphaticostomy of the thoracic duct, had one case successfully treated by this means (pneumococcus); while Lehman and Copher<sup>14</sup> report improvement in one patient who subsequently died.

Whether the life of the patient suffering from general peritonitis as a postoperative complication of suppurative appendicitis can best be conserved by enterostomy, by sedative or by active eliminative treatment still remains an open question. Increasing experience will probably show that each has its appropriate field in a certain type of case, or at a certain stage of the disease.

If enterostomy is to prove of value in a given case, it must be done early. On the other hand, it is apparent that some patients are so overwhelmed by their peritoneal sepsis that any interference is contraindicated, so that support and treatment of the Ochsner type offers the only hope.

The second postoperative complication in order of frequency in this series was secondary intraperitoneal abscess. This complication developed 18 times in the 392 drained cases, or 4.6 per cent. There were 6.2 per cent in Bancroft's<sup>1</sup> series. The development of these abscesses was usually signalized by the failure of temperature to subside or by its recurrence, attended by some pain, more or less distention and the presence of tenderness or a palpable mass. Ten of these abscesses were successfully drained through the original operative wound. The remaining eight required secondary operation for relief. Of these, four were subphrenic abscesses, two were in the right lumbar gutter, two subhepatic, and two in the left lower quadrant.

Of the eighteen patients developing secondary abscesses five died, including two of the four subphrenic cases; the subphrenic cases that survived were drained by rib resection. Here, as in the instance of general peritonitis, multiple complications played a part in the mortality. One of the fatal subphrenic cases developed a thoraco-abdominal fistula on the thirteenth day, the abscess rupturing into the lung. The other, following a prolonged septic fever, developed acute cholecystitis, and an inflamed gall bladder containing stones was removed on the forty-ninth day. The temperature elevation persisted, the patient developed a cough and died thirty-one days after the second operation. Autopsy revealed the subphrenic abscess and miliary tuberculosis. One patient developed pleural effusion and died with pulmonary edema following multiple abscess pocketings.

The therapeutic policy followed in these cases of secondary abscess was to await

definite localization of the abscess mass, then to approach it for drainage by the shortest feasible route. In several instances tender areas with corresponding symptoms that suggested developing abscesses subsided without interference. In 3 cases spontaneous drainage occurred through the wound.

Various authors report an incidence of fecal fistula, following drained appendectomies, of from 5 to 8 per cent. In this series there were five of these cases, or about 1.5 per cent, and no fatalities. Three of these fistulae occurred as complications of secondary abscesses, the remaining 2 developing at the wound site. Three closed spontaneously, 2 requiring secondary operative repair.

As a measure to prevent the possible development of fecal fistula by gut necrosis from drain pressure, daily shortening of the drains by an inch or more was the practice. Once the tract was well established the drains were usually removed entirely from the fourth to the eighth day after operation.

Mechanical ileus as a subsequent complication of these drained cases occurred five times in the group under study (1.3 per cent). One such complication developed in a case with diffuse peritonitis and secondary subhepatic abscess. An enterostomy was done on the twenty-seventh day with recovery. Another recovered following drainage of a secondary abscess on the ninth postoperative day. Of 3 cases of ileus that developed as the result of adhesions following diffuse peritonitis, 1 recovered after division of adhesions at a second operation on the sixteenth day, 1 recovered after ileostomy on the seventeenth day and 1 died after a colostomy done a month following the original appendectomy. An autopsy on this case revealed multiple adhesions throughout the abdomen.

Considering the number of cases in which inflammatory conditions were found, more or less widespread in the abdomen at the time of operation, it has been a matter of wonder that obstructive adhesions have not

been encountered more frequently. None of the patients returning to our follow-up clinic have given evidence of frank obstructive symptoms as a late complication, although there have been a number complaining of constipation. As a routine, after recovery from peritoneal inflammation, laxative diet and the use of mineral oil have been advised.

Cellulitis of the abdominal wall, with abscess formation, occurred in 3 cases; these recovered satisfactorily following drainage. No case of progressive gangrene of the abdomen, such as described by Brewer and Melenay, was encountered. There was one case, however, in which rather wide sloughing of the wound required skin grafting. During the past two years we have adopted Pool's advice against suture of these drained appendectomy wounds beyond the parietal peritoneum. While no statistics can be quoted from our records on this point, we have been impressed by the fact that we see much less sloughing of muscle and fascia than when suture is done, and that the unsutured wounds granulate more satisfactorily and heal more rapidly. This applies to the intermuscular incisions especially, as we have not ventured to leave our rectus incisions unsutured.

As to the late result in drained wounds, the recall clinic has produced six postoperative hernias, or 1.5 per cent. None of these occurred in unsutured cases, but the method has been used too short a time to permit the drawing of any conclusions from this fact. Of the six hernias, four occurred in intermuscular incision scars and two in rectus incisions. Since Stillman<sup>12</sup> in his earlier Roosevelt series reports an equivalent of 2.1 per cent and Bancroft 14.7 per cent, it is natural to suppose that there have been other cases of hernia which our follow-up has failed to find. Yet, since the number of intermuscular incisions greatly outnumbered those of the rectus type, the occurrence of hernia as found in this series seems to support the contention of the advocates of this approach. As a measure of

prevention against postoperative hernia it has been the practice to advise the wearing of a supporting belt for at least six months in the drained cases.

Of the incidental complications in these patients, diabetes was present in three, with two deaths. One of the fatal cases had diffuse peritonitis and died on the sixth postoperative day; insulin was used in this case. The other death occurred in a patient of sixty-six with severe nephritis besides the diabetes; no insulin was employed. The case that recovered, following appendectomy with drainage of an abscess, improved under the use of insulin. Abortion occurred three times in the series, with two deaths. These fatal cases were referred to in discussing the general peritonitis group, to which they both belonged. The recovery followed miscarriage on the ninth day after appendectomy and drainage of an abscess. Uremia was noted as occurring twice in elderly patients, once in a general peritonitis case (already noted), and once following drainage of an abscess. It proved fatal in both instances. Thrombophlebitis occurred in one case, in the right saphenous vein. Chicken-pox was an unwelcome addition in two instances. No record of parotitis was found in the entire group. This may have been merely good fortune, but we feel that there is some merit in careful mouth hygiene and in the practice of encouraging these septic patients to chew gum.

Pulmonary complications were not numerous. Pneumonia or bronchitis developed postoperatively in 8 cases (about 2 per cent) and resulted in 2 deaths. Empyema occurred in 1 case. Pulmonary embolism resulted in one fatality on the fifth postoperative day, while the one other patient in whom this accident occurred made a good recovery. It is possible that some of the cases reported as having pneumonia really suffered from massive collapse of the lung, although in none was it recognized as such.

Review of this group of cases presenting postoperative complications in suppurative appendicitis presents several features that

are perhaps worthy of comment. Pulmonary inflammations, always a source of apprehension, accounted for only one-tenth of the complications. Abdominal wall infection was infrequent, and sloughing was apparently less in unsutured wounds. Postoperative hernia was rather infrequent, being relatively much less common in intermuscular incisions. Mechanical ileus was rare, accounting for only one death in the series. Fecal fistula was not a prominent complication, and in but two instances was it possibly ascribable to the presence of drains in the wound; spontaneous closure was the rule rather than the exception. Next to spreading peritonitis, secondary abscess was the most frequent complication. The majority of these were within reach of the wound. Of the remote secondary abscesses, those of the subphrenic type proved the most grave. The presence of an intercurrent uremia, diabetes or pregnancy constituted a grave handicap to the patient suffering from severe intra-abdominal infection. Uncontrolled or progressing peritonitis remained, as it has always been, the least responsive to treatment, the greatest menace to the patient and the most trying problem to the surgeon.

#### REFERENCES

1. BANCROFT, F. W. *J. A. M. A.*, lxxv, 1635.
2. BEEKMAN, F. *et al. Am. J. M. Sci.*, cliv, 490.
3. GERSTER, A. G. *Ann. Surg.*, li, 490.
4. OCHSNER, A. *Internat. J. Surg.*, March, 1921.
5. CRILE, G. W. *Am. J. Obst.*, lxxi, 264.
6. MCKINNON, H. J. *A. M. A.*, July 23, 1921.
7. FOWLER, R. S. *J. A. M. A.*, lvii, 1531.
8. DEEVER, J. B. *N. York M. J.*, cxiv, 257.
9. JUDD, E. S. *M. Rec.*, lxxxii, 10.
10. TOREK, F. *N. York M. J.*, lxxxviii, 1068.
11. BLAKE, J. A. *Am. J. Med. Sci.*, cxxxiii, 454.
12. STILLMAN, A. M. *et S. Rep. Roosevelt Hospital*, 1915, 79.
13. COSTAIN, W. A. *Surg., Gynec. & Obst.*, xxxvi, 365.
14. LEHMAN, E. P., and COPHER, H. G. *Arch. Surg.*, 1925, x, 742.
15. MCLEOD, J. A. *Med. Rec.*, July 1921.

#### Discussion

DR. F. W. BANCROFT: It is indeed important that at intervals statistics of a series of cases should be reported, to compare with those of other authors. And yet it is difficult to compare statistics: for instance, Dr. Cutler's mortality

figures were 4 per cent for all cases of acute appendicitis, while those on Doctor Pool's cases reported by me were 4.2 per cent. On the other hand, Dr. Cutler reports a mortality of 10.5 per cent for suppurative cases, while in those I reported the mortality was 6.8 per cent. Our figures were taken from drained cases, and it is reasonable to assume that we may have classified some cases as suppurative that would not be so classified in Dr. Cutler's report. This might make the difference in our mortality statistics.

There is one point I should like to emphasize in the immediate postoperative treatment of suppurative appendicitis. During the anesthesia we have inserted the so-called Levin tube, which is a modification of a duodenal tube, through the nose. This is left in for forty-eight hours, and we allow the patient to drink unlimited quantities of water. If the tube is properly functioning this water is directly siphoned out. This diminishes immediate postoperative vomiting and puts the upper abdomen at rest. It seems that a great deal of attention has been given to keeping the lower abdomen at rest, but not so much to the necessity for rest of the upper abdomen. This procedure has been a routine measure on my service at the Lincoln Hospital, and we feel that we have had less complications since using it. In the series I reported, the percentage of peritoneal abscesses was higher than in those reported by Dr. Cutler. Our series showed 25, or 4.2 per cent. In low pelvic abscesses, we have found drainage through the anterior wall of the rectum an admirable measure. It is a simple procedure, and we have had no secondary complications due to its use. The dangers of abdominal approach are that the infection is spread and that occasionally a fecal fistula results.

I am interested in the difference in our figures in postoperative hernias. My statistics are from 500 followed cases examined personally. Many of these patients did not know that they had hernia. This might account for some of the discrepancy in the statistics of Dr. Cutler and myself. In studying the age incidence of hernia, I found that in children below ten years of age the percentage of hernia was 17, while between the ages of eleven and thirty it was about 6, and then rapidly increased to 25 in the decade between fifty and sixty years of age. As the active muscular life of an individual occurs between ten and thirty, it would seem that

hard work and exercise had nothing to do with the production of hernia. I believe that hernia is potentially created before the patient leaves the hospital; that is, if there is marked sloughing of fascia a hernia is apt to occur. In children and the aged this occurs more readily than in young, well-muscled adults. Since the adoption of no sutures in the wound save those necessary to close the peritoneum, the incidence of hernia has been reduced over 3 per cent in our figures. The sloughing of fascia is frequently caused by the insertion of sutures which traumatize the fascia and interfere with the blood supply. Certainly the average patient leaves the hospital in less time when sutures have not been inserted.

DR. R. T. MORRIS: Dr. Cutler speaks of the question of elimination treatment as opposed to the Ochsner method. That relates to the time for operation. After a spreading peritonitis has been halted, we may employ elimination methods aimed at disposal of toxins. The Ochsner treatment included the idea that any food or even water introduced into the stomach excites peristalsis, which spreads infection over the whole peritoneum. By starvation plus opium at times he put the bowel at rest. By causing cessation of peristalsis the area of infection became walled in. After that was his time to operate. That principle is a good one, but we may modify it by a two-minute operation for introducing drainage and then go on with the Ochsner starvation treatment. When we are sure the active peritonitis has ceased, then we may employ elimination methods. One of the best of these is a rectal injection of alum, 1 ounce in  $1\frac{1}{2}$  pints of water. In the bowel alum produces the same effect as it does in the mouth, exciting a free, watery secretion and bringing about a rapid pouring out of toxins. It commonly acts in ten or fifteen minutes. The Murphy drip has its place when we need to overcome acidosis and increase intravenous pressure. Flushing of the abdomen, I am glad to find, Dr. Cutler has dropped out. Inverting the stump of an appendix takes time and is unnecessary; instead, apply a simple catgut ligation. If fecal fistula occurs, it will close spontaneously if you leave it alone; it is a mistake to operate on these cases of fecal fistula.

DR. E. W. PETERSON: I wish to discuss but one point in Dr. Cutler's paper. Is enterostomy or is jejunostomy of value in the ileus which may complicate suppurative appendicitis? In



mechanical ileus there is no question as to the value of this procedure. In ileus of a purely toxic or paralytic type, however, it has been my experience that it is not only valueless but actually harmful. I have used it at the time of the original operation and also as a last resort in peritonitis cases, and never has it seemed to do any good. The duodenal tube, mentioned by Dr. Bancroft, will make the patient more comfortable and will accomplish much benefit in these cases.

DR. J. I. RUSSELL: Dr. Cutler and I are very much in accord on indications for operation and other points. By operating early we have tried to prevent the spreading of peritonitis. The mortality in cases of peritonitis depends on three factors: the extent of the peritonitis, the resistance of the patient, and the virulence of the organism, which varies with the individual.

Our information on any of these points is limited at the time of operation; we cannot judge whether the peritonitis is completely generalized or spreading, and we know nothing as to the resistance of the patient or the virulence of the organism in that particular individual.

The main question is when to operate. There has been a good deal of discussion whether to wait and then, after a thirty-six- or forty-eight-hour onset, to carry out the Ochsner method; or whether to operate immediately. My feeling in general is that immediate operation, removing the appendix and thereby the infecting focus, is the better procedure. There are exceptions to this rule and one is guided by indications at the time. The operation in spreading or generalized peritonitis is an easy one, inasmuch as the appendix is easily reached and quickly removed. I have not felt courageous enough to leave it in these cases of spreading peritonitis and I believe in the majority of cases it is better to remove the appendix, establishing drainage, and then executing the so-called Ochsner treatment and anticipating development of a localized collection of pus.

There is another point that Dr. Bancroft tells me he intended to speak of and that is in regard to the fact that anesthesia has changed. We are using more ethylene and nitrous oxide-oxygen. It will be interesting five years hence to see whether that will make any difference in these cases.

As to the question of ileostomy, at one time I thought it a good thing and I still cannot see that it is unattended by success. However, the

results in toxic ileus have been rather disappointing to me; when it is, or is associated with, a mechanical ileus, ileostomy is of utmost value.

DR. M. K. SMITH: I had a case of acute appendicitis with abscess in a severely diabetic patient on whom I performed appendectomy and drainage under local anesthesia. He developed gas gangrene and died in about a week. I gave him gas gangrene serum the day before death. This is the only instance in which I have had this complication in appendicial wounds, although it would seem that they might be liable to such infection. I felt that if the wound had been left unsutured about the drain the chances of the infection having developed might have been less.

DR. E. D. TRUESDELL: A mortality of 10 per cent is very creditable for a series of cases of the type requiring drainage. I have of late formed the habit of merely ligating the stump of the appendix when a drain is to be employed. If, in cases to be drained, the tissue of the appendix in the region of the cecum is in good condition, a ligature is adequate. If not, the less done to the appendix stump the better. It is uncommon at the present time to see cases of general peritonitis of appendicial origin; certainly they are less common than twenty years ago. It is probable that this is due to the fact that appendicitis is at present diagnosed with greater precision. I was glad to learn that Dr. Cutler believed in evacuating the bowel at an early date after operation in the sicker cases. It is my own habit in cases of suppurative appendicitis with drainage to order an enema twelve to twenty-four hours after operation and to repeat this every eight or twelve hours until the bowels are under control and distention has been relieved. In regard to leaving the wound open in the more severe cases, it seems to me that sloughing takes place so rarely that it would be unfair to the patient to leave all wounds open on this possibility. In my experience the great majority of wounds in drained cases have healed without sloughing, eventually becoming firm and strong.

DR. CUTLER (closing): On the question of wound healing after leaving it unsutured in drained cases, I am of definite opinion. The cases we used to sew up unquestionably had dirtier wounds afterwards than those we are now leaving unsutured.

I have been interested in reading of the effects of anti-Welch bacillus serum. The basis of the treatment is the hypothesis that a toxic

ileus is due to products from the growth of the Welch bacillus. We have not tried it in any of our cases but we shall probably do it some day because it is so highly spoken of. As to Dr. Peterson's question in regard to enterostomy and ileostomy, in my paper there were 5 cases in which enterostomy was done with the object of relieving paralytic ileus, and of these 1 survived. In cases where obstruction is the main feature it is a brilliant procedure, but when the ileus was toxic we were much less impressed. I shall try the alum enemas suggested by Dr. Morris. He advised against inverting the stump; I should be very much readier to ligate the stump without inversion had I not seen the third case that I shall present here. Ligation was done  $\frac{1}{2}$  in. from the base of the cecum; but fourteen months later an abscess developed, of the fulminating gangrenous type, in that stump. Dr. Bancroft's point concerning comparative statistics is very well taken in regard to postoperative herniae. I have suggested in the paper the deficiencies in our follow-up of cases in this particular. I was called up only last night to operate on a strangulated hernia in a case drained five years ago.

## PRESENTATION OF CASES

### GANGRENOUS APPENDICITIS; DIFFUSE PURULENT PERITONITIS; SECONDARY ABSCESS; DOUBLE FECAL FISTULA, WITH SPONTANEOUS CLOSURE; HEMORRHAGE INTO ABSCESS CAVITY AND BOWEL; RECOVERY

CONDICT W. CUTLER, JR., M.D.

A. H., aged thirty-nine, admitted to Roosevelt Hospital October 16, 1925, complaining of pain in the lower right abdomen. Feeling of lower abdominal distention began two and one-half days before admission. Catharsis twice, produced numerous bowel actions. Patient vomited four or five times one day after onset of pain. Six hours before admission pain suddenly ceased.

Marked right lower quadrant tenderness, and rigidity of entire lower abdomen. Tenderness on the right side of pelvis elicited by rectal examination. Temperature on admission  $102^{\circ}$ ; pulse 120; white blood cells 6,000, polynuclears 73 per cent.

Immediate operation revealed diffuse purulent peritonitis, with about 8 ounces of foul, brownish pus free in the peritoneum. The

appendix lay in retrocecal position, was gangrenous at the tip, and ruptured. It was removed, the pus was removed by suction and drains were inserted to the retrocecal space and pelvis. The wound was left unsutured.

The temperature subsided after operation to  $100^{\circ}$  on the second day, but began to rise on the ninth, with vomiting, frequent loose stools and abdominal pain; temperature  $102^{\circ}$ . Tenderness and mass were found in the lower left quadrant extending to the midline. White blood cells 20,000, polynuclears 85 per cent. Secondary operation for drainage of abscess on the thirteenth day. Patient was very ill, requiring infusions of saline solution with glucose.

There was much drainage, becoming fecal from both wounds. On the second day after the second operation there was profuse hemorrhage from the secondary wound, and a quantity of bright blood by rectum, suggesting the sloughing through of an intestinal wall vessel. Packing failed to control this. Coagulen (1 ampoule every 2 hrs.) was begun hypodermically and diminution of bleeding followed. As the patient was very much depleted a transfusion of 500 c.c. was given on the third day. Although some bleeding persisted, improvement began with cessation of vomiting, less diarrhea and lower temperature. The temperature reached normal on the fiftieth day after the first operation. Both fecal fistulae closed spontaneously and the patient was discharged on the eighty-second day. No subsequent complaints.

### APPENDICITIS WITH THICKENING OF ILEUM AND CECUM; DRAINAGE; POST-OPERATIVE BRONCHOPNEUMONIA AND EMPYEMA; ABDOMINAL WOUND SUPURATION AND FECAL FISTULA; PERSISTENT MASSIVE INFILTRATION OF CECUM AND ASCENDING COLON; RESECTION; RECOVERY

CONDICT W. CUTLER, JR., M.D.

V. L., aged forty-one, admitted June 17, 1926. Dull aching pain in the right lower quadrant for two months; more severe for one week. Ice bags have not given relief. Bowel movement daily. No vomiting.

Mass in right lower quadrant, tender. White blood cells 10,000, polynuclears 80 per cent; temperature  $99.2^{\circ}$ . Diagnosis: appendicial abscess.

Operation: day of admission. Right rectus

incision. Terminal ileum, base of cecum and appendix found, composing an infiltrated mass at the pelvic brim. Appendix not readily identified. Separation along cleavage line between mass and pelvic wall entered small abscess. Appendectomy not attempted because of induration. Drained.

Temperature gradually rose to 105.5° on sixth day with signs of bronchopneumonia, confirmed by roentgen-ray examination. w. b. c. 58,000, polymorphonuclears 95 per cent. Temperature subsided to normal on the twelfth day, then rose to run irregularly until the thirty-third day. Roentgen-ray examination and thoracentesis revealed purulent fluid in the right chest. During this time abdominal wound continued draining profusely, with some fecal content. On the thirty-fourth day thoracotomy with drainage was done with partial resection of seventh rib, right. Type iv pneumococcus. Temperature subsided and reached normal on the fortieth day. Chest tube removed. Patient improved, was out of bed on the forty-ninth day. Chill and temperature for two days followed, but subsided after opening of a pus pocket through abdominal wound. There was gradual improvement, but anemia and depletion continued. Transfusion on the fifty-eighth day was followed by more rapid improvement. Patient discharged with abdominal draining sinus on the seventy-ninth day.

October 12th, 1926, readmitted for fecal fistula.

Operation by Dr. Russell for closure of the fistula: Right rectus incision revealed a massive infiltration of the cecum and ascending colon into which the sinus led. The thickening was so great as to suggest new growth. The ileocecal junction was involved and the gut lumen much diminished. The cecum and colon were removed to the midtransverse colon and a side-to-side ileocolostomy done. The patient made an uneventful recovery and was discharged thirty days after operation. Patient has been well and gained twenty-five pounds in the six weeks since discharge.

#### RECURRENT ACUTE APPENDICITIS AFTER PARTIAL APPENDECTOMY

CONDUCT W. CUTLER, JR., M.D.

M. W., aged thirty-two, admitted January 26, 1925. Six days before admission the patient had epigastric pain after eating. This became more severe and cramp-like, localizing in the

umbilical region on the fourth day and requiring morphine. There was no vomiting, and for three days before admission no bowel movement.

Generalized lower abdominal tenderness; no definite localization. Slight rigidity. Some distention for which ox-gall enema gave relief. Temperature 101°, w. b. c., 16,000, polymorphonuclears 89 per cent. Diagnosis: acute appendicitis.

Operation on admission. A right rectus incision revealed a mass in the cecal region. A subcecal abscess was broken into and a large amount of thick foul pus escaped. The appendix was gangrenous and largely disintegrated. Fragments of appendix and two free fecoliths were removed. The stump with the cecum was much indurated and incorporated in the abscess wall. The stump was freed as far back as could safely be done, without endangering the cecal wall, and was clamped and tied off, inversion being impossible, about  $\frac{1}{2}$  in. from the cecum. Drains inserted. Culture: *B. coli*.

Fever persisted for five days, then uneventful recovery ensued, the patient being discharged on the twenty-sixth postoperative day.

Second admission, April 30, 1927 (14 months after discharge). Well until the day before when she had cramps in the lower abdomen and vomited. Pain became more intense and vomiting persisted. Two colonic irrigations at home without result.

Abdomen somewhat distended and tender in lower portion with some rigidity. Maximum tenderness in right lower quadrant. Temperature 103°; pulse 108; w. b. c., 17,000, polymorphonuclears 86 per cent. Diagnosis: intestinal obstruction.

Operation. Right intermuscular incision. There was a diffuse foul purulent exudate free in the peritoneum, apparently the result of a recent abscess. At the site of the appendix stump was a perforation in the cecum, the stump having sloughed away. The surrounding loops of small intestine were agglutinated with recent adhesions. The exudate was aspirated, the defect in the cecum sutured, the small intestinal coils freed, allowing passage of gas, and drains inserted. Culture: *B. coli* and short chain streptococcus.

Some peritonitis for four days, then gas and feces were freely expelled and recovery followed. Discharged on the forty-first day with discharging sinus.

Sinus has discharged to date, three small

fecoliths being extruded from time to time. Now sinus closes intermittently and discharge is much less in amount and thin. General health good.

This case is shown to illustrate the rare complication of recurrent appendicitis and the desirability, where possible, of burying the stump or making a very short amputation.

### SUPPURATIVE APPENDICITIS; PARALYTIC ILEUS; ENTEROSTOMY; RECOVERY

PHILIP J. LIPSETT, M.D.

E. D., an unmarried woman, on May 3, 1927 was seized with abdominal cramps. These were accompanied by nausea and she vomited several times without relief. She was seen by Dr. D. N. Shulman who advised immediate operation. The deliberations of the family took another day and I saw the patient in consultation the following day. At this time she presented the picture of an acutely ill person suffering from asthma and an attack of acute appendicitis. The pain had shifted to the right lower quadrant, and rigidity of the lower half of the abdomen was greater on the right than on the left side. There was exquisite tenderness in the right lower quadrant with rebound tenderness. Rectal examination disclosed no masses but tenderness in the right iliac fossa. Temperature 102°F., pulse 90, respirations 24. Patient denied anything that would suggest involvement of the adnexa.

I operated upon her three hours later at the St. Mark's Hospital, using spinal anesthesia on account of the asthma, through a right rectus incision. Free pus in the peritoneal cavity was encountered and aspirated.

The patient's appendix was gangrenous with a perforation at the base and was removed without inversion of the stump. Two eigalette drains, one into the pelvis and one to the appendix stump were inserted and the abdominal wall closed in layers. The patient was in fairly good condition after the operation and did well for four days. On the fourth day the drains were removed. On the fifth day slight distension was noted. There was no nausea, patient was able to pass flatus and the results of enemata were good. The distension subsided somewhat after the use of pituitrin, stupes and medicated enemata. Two days later it again increased, the patient began to vomit bile-stained fluid and passed no flatus. Under the

ordinary measures her condition improved again and she had a spontaneous bowel movement the next day. On the thirteenth day postoperative her condition took a sudden turn for the worse. She began to vomit incessantly, the distention increased, there was no passage of flatus and enemata were ineffectual. She presented the picture of an acute ileus minus the paroxysmal cramps. The measures heretofore used to combat the distension were of no avail and the patient became progressively worse. Gastric lavage sent her into collapse and she had to be stimulated.

A diagnosis was made of paralytic ileus or possibly one due to bands. Dr. B. T. Tilton, called in consultation, concurred in the diagnosis and advised jejunostomy or enterostomy as the last resort. On May 19, I performed an exploratory operation under spinal anesthesia because I was not quite satisfied that the condition was a straightforward paralytic ileus, and wished to rule out the possibility of a mechanical ileus. The patient was practically moribund. In addition to the obstruction she was suffering from asthma, the distention greatly interfering with her breathing.

The original operative wound was scaled off and a left rectus opening was made. There was no fluid in the abdominal cavity, the entire small gut was distended and lusterless. There were no collapsed loops visible. A rapid exploration of the right iliac fossa revealed surprisingly few pathological changes. In the process of exploration a pea-sized abscess in the mesentery was encountered. An ileostomy was done, Witzel type. The abdomen was closed in layers with the catheter fixed at the lower angle of the incision.

During the operation patient had to be stimulated and she received an ampoule each of pituitrin, caffeine, sodio-benzoate and digifolin. She was sent back to bed in very poor condition and anti-shock measures were instituted.

Two hours after operation there was a profuse discharge from the ileostomy opening and with the onset of the drainage from the bowel the patient began to improve; the distention started subsiding, the vomiting stopped and she was able to retain fluids by mouth. On the fifth day after the second operation the catheter was removed. The ileostomy drained for another day and then closed spontaneously and definitively. The abdominal incision healed except the lower part, which became slightly infected.

An interesting complication following the second operation was a specific parotitis which appeared on the first day after the ileostomy. The right side was involved first, the left side three days later. Both subsided without further trouble. A definite history of exposure was obtained from the patient. Discharged, cured, on June 3, 1927.

#### REPAIR OF STRANGULATED INCISIONAL HERNIA TWO YEARS AFTER SIMPLE DRAINAGE FOR APPENDICITIS ABSCCESS; APPENDECTOMY

FRANK B. BERRY, M.D.

M. C., aged fifty-nine, admitted to Bellevue Hospital March 4, 1925 with ten-day history of right lower quadrant pain. Firm, tender mass 10 cm. in diameter was found in the right iliac fossa. Râles at both lung bases. Temperature, 101.8, pulse 100, w.b.c. 21,000, polymorphonuclears 81 per cent. Because of the chest condition she was operated upon under local anesthesia by intermuscular incision. A well walled-off abscess was found. The appendix was not sought for and simple drainage was instituted. *B. coli* was obtained from the pus. The convalescence was uneventful and she left the hospital on the thirteenth day with a small fistulous sinus tract.

When seen in the follow-up two months later, there was a moderate-sized hernia. This gradually grew in spite of a belt. The fistula finally closed in November, 1926, and at that time the patient had a large easily reducible hernia partly controlled by her belt.

Early in May, 1927, twenty-six months after her original operation, the patient began to have attacks of right upper quadrant pain, radiating to the right shoulder and accompanied by vomiting. She described similar attacks twenty-five years ago. There was also auricular fibrillation. The hernia was causing no symptoms. She again entered the hospital with a diagnosis of probable gall-bladder disease and fibrillation. The day of admission she found she could not reduce her hernia. It was then the size of a grape-fruit. It became tender and pressure on it caused nausea. She refused operation at first and ice bags and rectal treatment kept her comfortable. After four days she consented to operation. Again this was done under local anesthesia. The neck of the sac was 3 to 4 cm. in diameter. During

reduction the appendix and the remains of a fecolith presented themselves. These were removed, and the hernia repair was then made. Convalescence was uninterrupted except for mild pleurisy twenty-three to twenty-eight days, postoperative. She was discharged on the thirty-first day and has remained well.

#### ACUTE SUPPURATIVE PLEURISY WITH SECONDARY PNEUMOCOCCUS PERITONITIS

PAUL A. DINEEN, M.D.

An Italian, aged thirty-eight, was admitted to the hospital May 25, 1926, two months after a right lobar pneumonia with empyema. He was profoundly toxic on admission. Aspiration of the chest had obtained pus. On the day of admission, under local anesthesia, a portion of the eighth rib on the right side was resected. On entering the pleural cavity a small, definitely walled-off space was entered and 8 oz. of pus were evacuated. The finger encountered a tense, bulging mass forming the roof of this cavity, and drainage of this mass yielded 25 oz. of pus. The two cavities were converted into one and two rubber tube drains were inserted.

The day following the patient complained of severe abdominal pain and began to vomit. Within twenty-four hours the vomitus was fecal and the patient was in poor condition. A high jejunostomy was done under local anesthesia. On entering the peritoneal cavity through a high left rectus incision a walled-off cavity containing 8 oz. of pus was entered and drained. The walls of this cavity were lined with fibrin and had the same general appearance as the cavity in the chest. Cultures from the thoracic and abdominal pus showed the same organism, namely pneumococcus, Group 1. Blood cultures were repeatedly negative.

The patient had a stormy convalescence and was in the hospital for seven weeks. The jejunostomy tube was removed eight days after operation and the stoma gradually closed, the abdominal incision being healed five weeks after operation. Two transfusions were given and seemed to aid the patient considerably.

Since leaving the hospital the patient has developed four large abscesses of the soft parts, requiring drainage. Cultures of the pus from these cavities showed staphylococcus aureus. The man is now well and strong.

# EDITORIALS

## FOCAL INFECTIONS

THE recognition of "focal" or primary infections is, of course, not new. Comparatively recent, however, is the development of a focal infection fad that finds its expression in the widespread and often indiscriminate removal of tonsils and teeth for the relief of various affections—from asthma to sciatica. Beyond dispute, the extraction of infected teeth or tonsils has sometimes been followed by amelioration of a chronic arthritis or the disappearance of pains in remote parts of the body. But what is the proportion of such cases in the total of those on whom these operations have been performed for "focal infection"? How many thousand individuals have been made tonsil-less and edentulous without any benefit; and what must they think of the physicians who persuaded them to such costly sacrifice?

There are many physicians, and also surgeons, who demand as part of a general cleaning-up process, and regardless of the patient's disease, the removal of teeth and tonsils that are condemned by laboratory examinations alone. Is there menace to the health of an individual because pus or the streptococcus viridans can be found in one or more tonsillar crypts, even though he has never had an attack of tonsillitis? And should he be submitted to tonsillectomy because he is developing exophthalmic goiter or has backache or pain in his arm? An enthusiastic physiotherapist has made the published statement that "it can be positively and definitely asserted that subdeltoid bursitis proceeds from a focal infection by the streptococcus viridans." When asked whether any investigation had led him to make so sweeping an assertion, he replied, "No, I merely think so!" Such bursae are usually the seat of adhesions or, at the outset, contain some sterile

serum; the frequently associated sub-bursal "lime deposit" contains only mineral salts, detritus, fat cells and blood fibrin, without bacteria or even leucocytes; and operation in a fairly acute stage will demonstrate a tear and hemorrhage in the supraspinatus tendon at the site of the deposit—indicating a traumatic rather than an infectious or toxic etiology.

It seems a rational procedure to remove gonorrheal epididymes in the treatment of obstinate gonococcal arthritis; but it would be interesting to know how many individuals whose epididymes have been condemned as seats of focal infection have been relieved of distant symptoms by epididymectomy.

Cholecystitis has been accused both of being, and of resulting from, a focal infection; but how often has there been satisfactory demonstration of the truth of either of those hypotheses? Various surgeons have held that cholecystitis is caused by appendicitis—a more direct pathway of infection than that from a distant focus. Sometimes a physical relationship between the two affected organs can be demonstrated at operation and, admittedly, association of the two diseases is not rare; but certainly it is far indeed from being the rule, and its occurrence is scarcely more frequent than might be expected of two such common processes.

We would not be understood as condemning either the theory of focal infection or its rational therapeutic application. We cheerfully admit the wisdom of treating or removing any tooth or tonsil that even may be the cause of some obstinate affection that defies all other diagnostic and therapeutic efforts; but we do protest against the hasty and light-hearted extrac-



tion of teeth and tonsils, without painstaking observation and examination, and in the face of known pathologic and physiologic processes. Is it not time that

the profession take stock of the results of these liberal sacrifices of teeth and tonsils before it is discredited by them?  
W. M. B.

## HETEROGRAFTS OF PRESERVED FASCIA

**A**MONG recent contributions to surgical literature, of much practical importance and scientific interest are those of Amos R. Koontz of Baltimore on Dead (Preserved) Fascia Grafts for Hernia Repair (*Ann. Surg.*, 1926, lxxxiii, 523, and *J. A. M. A.*, 1927, lxxxix, 1230).

We are familiar, of course, with the use of preserved kangaroo tendon sutures, introduced by Marcy and supposed to be slowly but completely absorbed, with McArthur's use of living suture strips from the cut edge of the obliquus externus aponeurosis, with Gallie and LeMesurier's suture strips of fascia lata cut from the patient's thigh and woven between Poupert's ligament and the obliquus internus muscle, and with the autograft transplantation of fascia to fill defects in the abdominal wall or elsewhere and for use in arthroplasty. Koontz' material is none of these, yet developmentally related to all of them. He uses chemically sterilized and preserved fascia from the ox or other animal; and he was led to do this especially by the observations of the French worker, Nageotte, "who transplanted pieces of alcohol-preserved tendon to repair anatomic defects in the tendons of living animals. He found that the graft of dead tendon "took" just as well as grafts of living tendon, and on subsequent microscopic studies of the implanted dead graft he found that the histologic changes which took place were as follows: The dead cells of the graft were removed by the wandering cells of the host; fibroblasts from the host grew into the persisting connective tissue framework of the graft, and repopulated this framework with living cells in the place of the old dead inhabitants; and finally, a new circulation was established in the graft, so that in a short while it was impos-

ble to tell that the graft had ever been dead. The theoretical considerations which formed the basis for Nageotte's work were his assumptions that the fibers of the connective tissues are inert coagula formed from living cells and that, hence, their preservation in alcohol does not change their physical or chemical character in the slightest, as they are, in fact, dead substances in the animal just as they are in the alcohol. If this is true, one would not then expect, when these tissues are implanted among living tissues, that they should act as foreign bodies and produce a foreign body reaction, phagocytosis, or show a tendency to be absorbed. They are simply inert fibers implanted among their fellows of the same kind."

Koontz used fascia of various origins, preserved in 70 per cent alcohol, to repair defects made in the sheath of the rectus and fascia lata of cats and dogs.

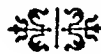
"Histologic study of the specimens removed at various intervals following operation showed that the same thing happened in the case of these dead fascia grafts as had happened in the case of Nageotte's grafts of dead tendon. The dead cells of the grafts had been replaced by living cells from the host, the graft had become firmly fixed to the surrounding tissues by the ingrowth of fibroblasts, and the implanted tissue had become vascularized . . . Large ventral hernias were produced in dogs and later repaired by suturing over the defect large sheets of dead fascia . . . It was found that the fascia lata of the ox gave the best results. The hernias were cured, and on subsequent examination it would have been impossible to determine the limits of the dead graft but for the row of black silk sutures used."



Since his earlier report Koontz has been using suture strips of alcohol-preserved fascia lata of the ox for the repair of hernias in the human being by the method of Gallie and LeMesurier. He has operated upon seventeen cases with excellent results, one of them a man of seventy whose inguinal hernia, operated upon five times before, had each time recurred. Koontz mentions that other surgeons in various parts of the country have also used preserved fascia strips for hernia repairs with excellent results, and he believes that its employment will become more widespread when it can be put on the market in convenient form. If it is, indeed, as good as the living autografted

strips of Gallie and LeMesurier it will be far more acceptable, for to secure the latter not only leaves a large, unsightly scar on the thigh, but also greatly complicates the operation of hernioplasty. The use of preserved fascia in sheets and in strands will probably have a large field beyond the repair of hernial defects. Further observations may show its limitations and defects. It would appear now, however, that Koontz, Nageotte and other experimentalists have introduced a new biological principle into surgery, and also that our notions concerning the behavior of heterografts in the body will need some revision.

W. M. B.



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## BOOK REVIEWS

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**BONE SARCOMA.** The Primary Malignant Tumors of Bone and the Giant Cell Tumor. By Anatole Kolodny, PH.D., M.D., Dept. Surg., State Univ. of Iowa. Authorized by American College of Surgeons. 8vo. Cloth. Pp. 214; 104 illus. Chicago, Surgical Publishing Co., 1927.

Until the establishment of the Registry of Bone Sarcoma by Dr. Ernest Codman, our information concerning the varieties and prognoses, as well as the treatment of sarcoma of bone, was unsatisfactory and uncertain. Few surgeons saw any large number of such cases and only very few were granted the opportunity of observing end-results. With the establishment of the Registry, a method was developed of accumulating not only many specimens and roentgenograms but also a large volume of statistics, and even of noting the end-results in cases that drifted from the original surgeon to the care of another. Except for Codman's little book (*Bone Sarcoma*. N. Y. Paul B. Hoeber, Inc., 1925), the accumulated data of the Registry remained unanalyzed. The task of carefully studying these data could scarcely have been entrusted to anyone better fitted for it than Kolodny. In a clear, concise and interesting manner the facts about bone sarcomata are isolated and, after critical interpretation, assigned to their proper place in the composite picture.

The author begins his work with a critical analysis of the method of classification adopted by the Registry. He shows that the classification previously used is open to criticism in that several of the subdivisions under which tumors of bone were grouped are without justification in either pathological or clinical differences. He suggests, in consequence, the adoption of a somewhat modified scheme in which all primary sarcomatous bone tumors, without regard to anatomical or pathological variations, are grouped under the heading, osteogenic sarcoma. The second class includes tumors of the type known as Ewing's tumor, the third embraces myelomata and the fourth is comprised of a relatively small group containing extraperiosteal sarcomata and angioendotheliomata. The tumor, once designated as giant cell sarcoma and by other names, is now called giant cell tumor which emphasizes its ordinarily

benign nature as compared with the malignant sarcomata. To the discussion of the biological characteristics, the roentgenological criteria and the therapeutic indications of each of these five different types of tumors of bone the author devotes a whole chapter. The greatest emphasis is, of course, laid upon the consideration of the *osteogenic sarcoma and the giant cell tumor*.

The impression gained from the author's review of osteogenic sarcoma is anything but optimistic. Though the diagnosis can usually be made, there are instances where the most malignant type of tumor remained unrecognized. The prognosis is in all cases of the gravest and the therapy is apparently unavailing, as a rule. In cases of non-sclerosing osteogenic sarcoma, Kolodny suggests immobilization of the extremity, followed after a few months of recumbency and radiation by amputation. In Ewing's type of tumor, primary amputation appears to be futile and the author therefore advises recumbency and heavy radiation. Where the tumor recurs, excision or amputation may be undertaken with some hope of success. The myelomata, being multiple and composed of lymphoid cellular elements, are not amenable to surgical therapy but are fairly successfully treated by radiation. They have a somewhat better prognosis than the other types of malignant tumors of bone. In the treatment of the giant cell tumor, conservative measures seem to be justifiable. Of these, radiation appears to be quite as effective as the more commonly employed surgical curettage.

This is but the barest sketch of Kolodny's excellent work; to be appreciated it must be read carefully. It is nothing less than a monument to the efforts of the Sarcoma Registry of the American College of Surgeons and to the author's knowledge and broad scientific viewpoint. The volume is beautifully illustrated by a wealth of photomicrographs, roentgenograms and photographs. It is well deserving of premier position among the books of those interested in the problems of bone tumors.

**A TEXT BOOK OF BACTERIOLOGY.** By William W. Ford, Prof. Bacteriology, School of Hygiene and Public Health; Lecturer on Hygiene, School of Med., Johns Hopkins Univ.; Member State Dept. Health, Mary-

land. 8vo. Cloth. \$8.50. Pp. 1069; 186 illus. Phila., W. B. Saunders Co., 1927.

The appearance of a new book on bacteriology challenges attention, when so many good textbooks on the subject exist. Ford's work displays evidence of the greatest industry.

Part one is an historical presentation and a discussion of the morphology, staining and vital activities of bacteria and methods of infection, with a discussion of classification following.

Part two, on "Systematic Bacteriology," provides an exhaustive study of individual organisms, with excellent colored illustrations. The classification of Schizomycetes found in the table of contents might have been reprinted in the text, to advantage. It is unfortunate that there are so few references to papers appearing after 1920, and that the references in the section on diphtheria fail to mention the excellent monograph published by the British Research Council in 1920.

Part three is a very good presentation of the distribution of bacteria, and includes some references to the more recent literature. Part four, on infection, gives the orthodox presentation of this topic. The bacteriophage has a brief chapter, but there is no mention of Bronfenbrener's or Schwartzman's work.

The spirochetes and infectious microorganisms of undetermined character, such as Rickettsia, are taken up in the final chapters. The recent epoch-making work of Noguchi and his collaborators is not included, which, however, is only a commentary on the difficulty of making entirely up-to-date any textbook in a discipline advancing as rapidly as bacteriology. This volume will prove helpful in laboratories, to public health workers, and to practicing physicians and surgeons. The latter are constantly engaged in the practical control of bacterial growth in the human body.

The publishers may be proud of a book which is well printed and has illustrations rivalling those in the best German texts.

**PHYSICAL DIAGNOSIS.** By Richard C. Cabot, Prof. of Med., Harvard Univ. Ed. 9. Cloth. \$5. 8vo. Pp. 536; 6 pl., 279 illus. N. Y. William Wood & Co., 1927.

In this edition of Cabot's excellent and popular book the chapters on the blood, tuberculosis and cardiovascular diseases have been revised.

**MANUAL OF THE DISEASES OF THE EYE.** For Students and General Practitioners. By Charles H. May, M.D., Director and Visiting Surg., Eye Service, Bellevue Hospital, N. Y., 1916 to 1926; Consulting Ophthalmologist to Mt. Sinai, French, and Italian Hospitals, N. Y., and to Monmouth Memorial Hospital; etc. Ed. 12. 8vo. Cloth. \$4. Pp. 445; 374 illus. including 73 colored figs. New York: William Wood and Co., 1927.

This quite remarkable little work, which has been through eleven editions and many reprintings here, as well as numerous foreign editions—British, Spanish, French, Italian, German, Dutch, Japanese and Chinese—continues to hold its popularity as a manual for students and general practitioners. In spite of its numerous rewritings and abundance of plain and colored illustrations, the author has succeeded in keeping the volume down to small size. This edition, for example, has the same number of pages as the eleventh, despite revision. The modernity of the text makes Figures 21, 34 and 35 look incongruous; they illustrate illumination of the eye by gaslight!

**A TREATISE ON ORTHOPAEDIC SURGERY.** By Royal Whitman, M.D., M.R.C.S., F.A.C.S., Surg. to Hospital for Ruptured and Crippled, Consultant to St. Giles and St. John's Guild Hospitals, to New York and Darrach Homes for Crippled Children, to Polyclinic Hospital, to St. Agnes' Hospital, Westchester, and to Shriners' Hospital at Montreal, to N. Y. State Board of Health and to State Dept. of Labor, etc. Ed. 8. 8vo. Cloth. \$9. Pp. 1061; 954 engravings. Phila. Lea & Febiger, 1927.

Whitman is a keen observer and an impressive teacher and the many who, as students, assistants, interns or clinic visitors, have listened to him and seen him work, have learned much from a master. In addition, he has given to the profession the abduction treatment of fracture of the neck of the femur, the reconstruction operation for ununited fracture and certain other conditions of the hip, astragalectomy—and further, an excellent textbook of orthopedic surgery.

This is not an exhaustive treatise but it is a large volume, growing larger with each edition, and each of these has been exponential of the art and science of orthopedics at the time of its issue. A comparison of these editions, and par-

## Book Reviews

ticularly of this with the first, shows strikingly how this specialty has developed in the operative field and also in the field of helio- and physiotherapy, and how much it has grown into traumatic and reconstructive surgery, the treatment of all the inflammatory and neoplastic diseases of bone, of fractures, of dislocations—in short, what may well be termed “skeletal surgery,” as contrasted with the surgery of deformities only.

In the rather recently added chapter on “Collateral Orthopaedic Surgery,” fractures are dealt with only briefly, except the author’s abduction treatment of fracture of the neck of the femur and his reconstruction operation. In the seventh edition there was no heading over the text immediately following the paragraphs on “central fracture of the acetabulum,” and that running title ran on several pages devoted to other subjects. This curious typographic oversight was not corrected in this edition.

Aside from the space allotted to hip, as contrasted with other fractures (a disproportion pardonable because the author describes his own methods), the allotment of text and illustrations to the topics discussed in this work is in accordance with their importance and their incidence in orthopedic practice and, especially, in the practice of the author.

This edition is about seventy pages larger than the preceding and contains much new matter. Thus, five pages are given to the description and illustration of Finney and Hughson’s operation for torticollis.

## BOOKS RECEIVED

FISTULA OF THE ANUS AND RECTUM. By Charles John Drueck, M.D., F.A.C.S., Professor of Rectal Diseases, Post-Graduate Hospital and Medical School, Chicago. 8vo. Cloth. Pp. 318; 66 illus. Phila. F. A. Davis Co., 1927.

SURGICAL DISEASES OF THE GALL BLADDER, LIVER AND PANCREAS AND THEIR TREATMENT. By Moses Behrend, A.M., M.D., F.A.C.S., Attending Surgeon to the Jewish and Mt. Sinai and Northern Liberties Hospitals; Consulting Surgeon to the Hebrew Orphans Home, the Jewish Maternity Hospital, and Jewish Seaside Home, Atlantic City; Instructor in Anatomy in the Jefferson Medical College. 8vo. Cloth. Pp. 278; 101 illus. Phila. F. A. Davis Co., 1927.

THE SCIENCE AND PRACTICE OF SURGERY. By W. H. C. Romanis, M.A., M.B., M.Ch., Cantab., F.R.C.S. (Eng.), F.R.S. (Edin.); Senior Surgeon in Charge of Out-patients and Teacher of Practical Surgery, St. Thomas’ Hospital; Surgeon to City of London Hospital for Diseases of the Chest; Examiner in Surgery to Univ. Cambridge, etc.; and Philip H.

Mitchiner, M.D., M.S. (Lond.), F.R.C.S. (Eng.); Surgeon in Charge of Out-patients, Teacher of Operative Surgery and Demonstrator of Anatomy, St. Thomas’ Hospital; etc. 2 vol. 8vo. Cloth. \$12. Pp. 1750; 666 illus. N. Y. William Wood & Co., 1927.

MINOR SURGERY. By Arthur E. Hertzler, M.D., F.A.C.S., Chief Surgeon, Halstead Hospital; and Victor E. Chesky, A.B., M.D., F.A.C.S., Chief Resident Surgeon, Halstead Hospital. 8vo. Cloth. \$10. Pp. 568; 438 illus. St. Louis: C. V. Mosby Co., 1927.

EMERGENCIES OF A GENERAL PRACTICE. By the late Nathan Clark Morse, A.B., M.D., F.A.C.S. Revised and Rewritten by Amos Watson Colcord, M.D., Surgeon, Carnegie Steel Co.; Surgeon, Pennsylvania Railroad System; etc. Ed. 2. 8vo. Cloth. \$10. Pp. 541; 311 illus. St. Louis: C. V. Mosby Co., 1927.

CHIRURGISCHE RÖNTGENOLOGIE. Ein Grundriss der Anwendung der Röntgenstrahlen in der Chirurgie mit einem Anhang Radiumtherapie. By Dr. Hans Kurtzahn; Privatdozent für Chirurgie, Chirurgische Universitäts-Klinik, Königsberg. 8vo. Mk. 10.20. Paper. Pp. 216; 110 illus. Berlin: Urban & Schwarzenberg, 1927.

INDIKATIONEN FÜR DIE OPERATIVE BEHANDLUNG DER FRAUENKRANKHEITEN. By Dr. Walther Benthin; a.o. Professor an der Albertus-Universität und leitender Arzt der Abteilung für Geburtshilfe und Frauenkrankheiten des städtischen Krankenhauses zu Königsberg i.Pr. 8vo. Mk. 10.20. Paper. Pp. 226. Berlin: Urban & Schwatzenberg, 1927.

SURGERY, ITS PRINCIPLES AND PRACTICE FOR STUDENTS AND PRACTITIONERS. By Astley Paston Cooper Ashhurst, A.B., M.D., F.A.C.S., Professor of Clinical Surgery in the University of Pennsylvania; Surgeon to the Episcopal Hospital and to the Philadelphia Orthopedic Hospital and Infirmary for Nervous Diseases; Colonel, Medical Reserve Corps, U. S. Army. Ed. 3. 8vo. Cloth. \$10. Pp. 1179; 15 colored plates and 1046 illus. Phila. Lea & Febiger, 1927.

MANUAL OF SURGERY (Rose and Carless). For Students and Practitioners. By Albert Carless, C.B.E., M.B., M.S. (Lond.), F.R.C.S., Hon. Fellow, American College of Surgeons; Emeritus Professor of Surgery, King’s College, London; and Consulting Surgeon, King’s College Hospital, etc.; and Cecil P. G. Wakeley, F.R.C.S. (Eng.), F.R.S. (Edin.); Erasmus Wilson Lecturer, Royal College of Surgeons of England; Assistant Surgeon, King’s College Hospital; Lecturer in Surgery, King’s College Hospital Medical School; Assistant Surgeon, Belgrave Hospital for Children and West End Hospital for Nervous Diseases, etc. Ed. 12. 8vo. Cloth. \$11. Pp. 1544; 639 illus. N. Y. William Wood & Co., 1927.

NASAL NEUROLOGY, HEADACHES AND EYE DISORDERS. By Greenfield Sluder, M.D., F.A.C.S., Clinical Professor and Director of the Department of Rhinology, Washington University School of Medicine, St. Louis. 8vo. Cloth. \$11.50. Pp. 428; 167 illus. St. Louis: C. V. Mosby Co., 1927.

GONOCOCCAL INFECTION IN THE MALE. By Abraham L. Wolbarst, M.D., Urologist and Director of Urologic Clinics, Beth Israel Hospital; Consulting Urologist, Central Islip State Hospital, Manhattan State Hospital, and Jewish Memorial Hospital, etc. 8vo.

Cloth. \$5.50. Pp. 237; 89 illus. St. Louis: C. V. Mosby Co., 1927.

A SYNOPSIS OF SURGERY. By Ernest W. Hey Groves, M.S., M.D., B.Sc. (Lond.), F.R.C.S. (Eng.); Surgeon to the Bristol General Hospital; Professor of Surgery, Bristol University; Examiner in Surgery, Universities of London, Liverpool, Leeds, and Sheffield. Ed. 8. 12mo. Cloth. \$5. Pp. 674; illus. N. Y. William Wood & Co., 1927.

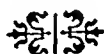
AN OUTLINE HISTORY OF OPHTHALMOLOGY. By Thomas Hall Shastid, A.M., M.D., F.A.C.S., Sc.D., LL.B., etc. 8vo. Cloth. Pp. 32. Southbridge, Mass.: American Optical Co., 1927.

ESPIRITU DE LA UNIVERSIDAD MODERNA. By Dr. Rafael Araya, Decano de la Facultad de Ciencias Médicas de la Universidad Nacional del Litoral; Professor

de Clínica Ginecológica en la Facultad de Medicina de Rosario. 8vo. Paper. Pp. 164. Rosario: J. B. Ravani, 1927.

HISTORY OF THE INCANDESCENT LAMP. By John W. Howell and Henry Schroeder. Cloth. 12mo. Pp. 208; illus. Schenectady: The Maqua Co., 1927.

PRACTICE OF UROLOGY AND SYPHILOLOGY. A Surgical Treatise on Genito-Urinary Diseases and Syphilis. By Charles H. Chetwood, M.D., LL.D., F.A.C.S.; Attending Urologist and Director of Service, French Hospital; Consulting Surgeon to Bellevue Hospital; Special Consulting Surgeon to Knickerbocker Hospital, St. Johns Hospital (L. I. City), Nassau Hospital (Mineola), St. Agnes and White Plains Hospital, etc. Ed. 4. 8vo. Cloth. \$9. Pp. 879; 314 illus. N. Y. William Wood & Co., 1927.



# PROGRESS IN SURGERY

*Selections from Recent Literature*

BROWN, LEWIS G. Mediastinal cyst. *Radiology*, November, 1926, vii, 436-438.

The patient, a married woman aged thirty-five, had had a thyroidectomy which was followed by pneumonia, the patient being confined to bed for seven weeks. Since then there has been continuous cough and copious expectoration of thick, foul sputum. There was marked loss of weight and energy. A roentgen examination showed a globular, non-pulsating mass  $4\frac{1}{2}$  inches in diameter attached to the upper mediastinal shadow and closely related to the left main bronchus, through which it probably drained. It lay behind the bifurcation of the trachea and displaced the esophagus  $1\frac{1}{2}$  inches to the right and backwards. The posterior wall of the shadow was about  $1\frac{1}{4}$  inches from the posterior thoracic wall. An outline of the mass was transposed to an anatomical cross section of the region. The relation of the shadow to the mediastinum, its partial drainage through the bronchus and its even globular, nonpulsating outline suggested a cyst.

Several attempts at aspiration were made, but unsuccessfully. With the assistance of an improvised arrangement of two roentgenoscopes at right angles, a small caliber needle was inserted safely through the posterior wall. The needled point being found well within the mass, aspiration was attempted but owing to the thickness of the contents met with only partial success. A small amount of air was injected which proved by its change of position when the patient assumed various postures that the contents of the mass were fluid or semifluid. The surgeon followed up the drainage still in place, establishing partial drainage. There followed complete cessation of cough and expectoration and a rapid gain in weight and strength.

The patient was reexamined five years later and the empty cyst was found to be only slightly diminished in size. The distortion of the esophagus has remained practically unchanged. The patient refuses further operation and remains in excellent health. There is no cough nor expectoration but the tube is retained in position, drainage is practically nil, the dressing applied once or twice daily showing only a stain and the odor is scarcely noticeable. An attempt to remove the tube about two years ago demonstrated its impracticability at that time by a return of the symptoms.

CHANDLER, F. G., and YOUNG, J. M. Lipiodol in pulmonary diagnosis: its uses and limitations. *Brit. M. J.*, Feb. 5, 1927, i, 228-230.

Lipiodol injections enable the diagnosis and localization of bronchiectatic dilatations with certainty, and in many cases it is the only method of proving the diagnosis. Its use enables the differentiation of bronchiectasis from lung abscess, from empyema with a bronchopleural fistula and from tuberculous empyema with a pleural fistula, the help given by lipiodol is of a negative character. It does not appear to enter the pulmonary abscess but stops short of it; nor does it easily flow through the bronchial fistula into an empyema cavity.

Tuberculous cavities fill readily but it has been suggested that injections are undesirable in cases of pulmonary tuberculosis. In the opinion of the authors the method described is simple and harmless, giving invaluable help in certain cases but possessing limitations. It is doubtful if there is any other picture obtained after lipiodol injection which can be considered unequivocally pathognomonic. The authors base this conclusion on their own admittedly limited experience with 50 injections. Eight of the cases are described very briefly. The method of injection employed by the authors has been almost exclusively through the cricothyroid membrane. The patient is cocainized and suffers little if any discomfort. Occasionally the patient may complain of the taste and smell of the lipiodol. In sensitive subjects the symptoms of iodism may occur. In one case there appeared a characteristic rash and in another an attack of asthma seemed to be precipitated. No other harmful effects have been noted.

POLAK, JOHN OSBORN. How the pathology of fibroid tumors of the uterus will determine the selection of radium or operation in their treatment. *Am. J. Obst. & Gynec.*, December, 1926, xii, 781-792.

Before subjecting any woman to roentgen or radium therapy she should be examined under anesthesia to determine the exact relation and location of the tumor mass or masses, and a diagnostic curettage should be made to exclude malignancy. All scrapings should be submitted to the pathologist. The following types of tumor demand operation: (1) Tumors larger than a three months' pregnancy; (2)

rapidly growing tumors which suggest progressive changes; (3) tumors producing pressure symptoms; (4) tumors associated with pelvic pain; (5) pedunculated tumors, in which radium only increases the necrosis; (6) tumors with adnexal pathology; (7) tumors with associated secondary anemia (cachectic appearance) in which the uterine hemorrhage has not been sufficient to account for the degree of anemia; (8) tumors in young women; (9) multiple submucous tumors destroying the uterine cavity (radium in these cases is likely to produce pyometra), and finally in cases where the tumor mass cannot be definitely differentiated and in women who fear radium. All of these cases require either myomectomy or hysterectomy.

Radium may be used for the control of hemorrhage in tumors, within the confines of the uterus, if the tumor is not larger than a three month's pregnancy and is without adnexal growth or parametrial or peritoneal lesions.

WERNER, PAUL. Roentgen-ray treatment of benign gynecological diseases. *Am. J. Obst. & Gynec.*, January, 1927, xiii, 54-60.

Irradiation of the spleen for the treatment of all kinds of hemorrhages in benign affections has been attended with considerable success. The technique of this type of treatment is very simple. Above the area of the spleen, established by percussion, a field is drawn 15 cm. long by 10 cm. wide. Irradiation is carried out with the patient lying on her right side, with the same apparatus, tube and filter generally used for intensive treatment. The local distance from the skin is 40 cm., the dosage measured on the skin is one-third of the erythema dose. The conditions amenable to such treatment are puberty hemorrhages in young girls, hemorrhages with adnexal masses, miscarriages, climacteric metrorrhagias, hemorrhages from fibromyomatous uteri or presumably due to endocrine disturbances of the ovaries in the absence of definite pathologic findings. In 70 per cent of the cases a favorable effect followed a single spleen irradiation. The results of repeated irradiations were not satisfactory. One can hardly speak of permanent results from irradiation of the spleen. Most probably the treatment simply removes a temporary disturbance so that normal conditions may establish themselves in the meantime.

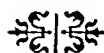
The author has observed a long series of cases in obstetric work where severe melena and vomiting of blood in infants was stopped by a

single irradiation of the spleen for five minutes (without any other therapy). All hemorrhage ceased immediately and the infants recovered. The prompt effect of spleen irradiation renders the procedure particularly valuable in metrorrhagias from fibroma or incident to the climacterium. In cases where spleen irradiations have failed the author has repeatedly obtained success by subsequent irradiations of the liver.

Irradiations of the hypophysis have been found useful. Small doses administered to the hypophysis in cases due to hypo- or dysfunction of the ovaries were employed by the author. A field is outlined  $2 \times 3$  cm. about at the center, between the outer circumference of the orbit and the anterior boundary of the external auditory meatus and this area on either side of the head is given one-third of the skin erythema dose. Not the slightest injurious effect upon the patient could be discovered. Surprisingly good results were obtained in dysmenorrhea and amenorrhea. Although the result was not always permanent a second treatment six or eight months later brought the desired relief in all cases. This treatment was extended to gynecologic conditions not obviously due to endocrine disturbances, such as leucorrhea, pruritus vulvae, etc., and improvement and even permanent cures were obtained. The treatment has also been found to be effective in certain types of pregnancy toxicosis, especially hyperemesis and hypersalivation. Though very effective in most cases of dysmenorrhea, amenorrhea or climacteric molimina, irradiation of the hypophysis will be found to leave certain refractory patients unaffected. In some of these instances it has been found that the desired therapeutic result can still be obtained by applying the same dose of roentgen rays to the thyroid.

SEIDEMANN, HANS. On the operability or inoperability of uterus carcinomas after irradiation. *Strahlentherapie*, 1926, xxii, 554-561.

The author states that F. Heimann deserves credit for first showing in 1914 the possibility of utilizing preoperative roentgen irradiations in the treatment of uterus carcinoma. There are presented case reports of 4 women treated by intensive preoperative roentgen irradiation followed by total extirpation of uterus carcinomas. Although a final conclusion is yet to be reached it seems safe to state that the method, especially in inoperable cases, offers a better prognosis than anything hitherto proposed.





# SUBJECT INDEX TO VOLUME III

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